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A. A. R. Electrical Sections and Manufacturers Meet in Chicago

Both reports and exhibits show the rapid expansion and increasing importance of electrical developments in the railroad field

The two Electrical Sections of the Association of American Railroads held their annual meetings in the Hotel Sherman, Chicago, September 8-10. The Electrical Section of the Engineering Division held its meeting on Wednesday, September 8. The Electrical Section of the Mechanical Division met on Wednesday and Thursday, September 8 and 9. The Railway Electric Supply Manufacturers Association held exhibits in the Hotel Sherman for three days, September 8, 9 and 10.

Electrical Section, Engineering Division

The meeting of the Electrical Section, Engineering Division, A.A.R., was called to order at 10 a.m. by Chairman K. H. Gordon, assistant electrical engineer, Pennsylvania. Mr. Gordon, in turn, introduced Charles H. Mottier, Chairman, Engineering Division, A.A.R., and vice president and chief engineer, Illinois Central. Mr. Mottier congratulated the Section on the excellence of the reports which had been prepared, giving special attention to the research work which has been done by the Committee on Electrolysis. He said, also, that the Electrical Section is especially fortunate in that large electrical manufacturers do much basic research of direct benefit to the Section.

He said that practically all activities of the Engineering Department now require electrical equipment and elec-

Electrical Section, Engineering Division, Association of American Railroads

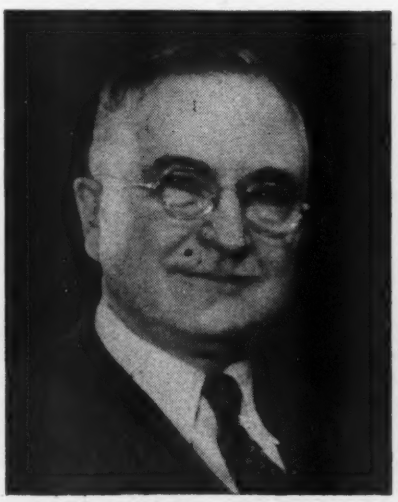
Officers

K. H. Gordon, *Chairman,* assistant electrical engineer, Pennsylvania, Philadelphia, Pa.

S. R. Negley, *Vice Chairman,* Electrical Engineer, Reading, Philadelphia, Pa.

W. S. Lacher, *Secretary,* Electrical Section, Engineering Division, A. A. R., Chicago.

K. H. Gordon



W. S. Lacher

S. R. Negley

trical services. As an example, he described snow melters now used by the Illinois Central. With reference to pumping plants, he said that his railroad had 56 automatic electric plants before the war, and that it now has a total of 103 electric pumping plants, and only 17 others —10 of which are steam, and 7 Diesel.

Following Mr. Mottier, Chairman Gordon spoke briefly, and further emphasized the rapid expansion of the electrical industry. He called attention to the fact that the total output of the central station industry has reached one peak after another. The total weekly output exceeded five billion kw.-hr. last year, and this year has fallen below that mark only three times—these on holiday weeks. Speaking specifically of the railroads, he said, that those in this country had on hand, or on order, between 11 and 12 million horsepower of Diesel-electric locomotives. This, he said, equals about one sixth of the total installed generating capacity of all utility and government-owned generating stations. In addition to this, he said, something over three million hp. of electric locomotives and cars are in service and the railroads have nearly two million hp. of miscellaneous electrical apparatus.

Power Supply

A lantern battery tester which is used to determine the amount of life remaining in dry batteries used for trainmen's hand lanterns was described in the 1946 and 1947 reports. The 1948 report states that there have been no changes in the circuit or the design of battery testers subsequent to the report of last year, since when attempts have been made to impress upon employees responsible for the distribution of batteries, the importance of testing old batteries before giving out new ones. Instructions have been issued that in no instance should a new battery be given out unless the old battery has been tested and its remaining life is found to be less than 12 hours. A form is being used to facilitate keeping a record of batteries tested, from which men using more batteries than believed necessary can be noted.

It is estimated from records that 12 per cent of the batteries brought in for renewal can be returned to service providing the tester is properly used. It has also been ascertained that the installation of a battery tester is justified at locations where 17 or more batteries are issued per month. This is based upon an average life of 40 hours per battery each costing 40c. The life of the tester is assumed to be 5 years without replacement of parts. The tester was designed and built around a battery averaging 40 hours of useful life. It is of interest to note that three of the leading types of batteries are now averaging approximately 65 hours of useful life.

Power for Camp Cars

To determine the practice or current methods of supplying power to camp cars from local circuits, a questionnaire was sent to voting representatives of member roads of the Electrical Section on September 20, 1947. Replies were received from 62 railroads, six of which reported no camp cars in service.

Question 1 related to the general practice of wiring camp cars for electric lights and power tools. Twenty-seven of the railroads reported that it was their general practice to wire camp cars for electric lights. A few replies stated that camp cars are not generally wired for electric lights, but it is done in special cases. Only five railroads reported that it was their practice to provide wiring for heavy power tools and equipment. Some of those reporting stated that where wiring was provided for electric lights, it was the general practice to install convenience receptacles for the use of electric razors, radios, electric irons and small tools. A few railroads stated that foremen are permitted to wire their cars on condition that the wiring installation is approved by the electrical department.

In Question 2, information was requested as to special wayside transformers, local circuits or receptacles that are provided for supplying power to camp cars. Twenty railroads reported that special arrangements were provided locally for service connections. Thirty-three of those returning the questionnaire stated that no special installations or arrangements were provided at local points where camp cars were usually placed. A number of railroads reported that camp cars on their lines are equipped with gasoline engine generators which eliminate the necessity of providing local service equipment. Others reported the use of standby engine-driven generators at locations where an outside service was not available. The service or supply equipment mentioned by some of the reporting roads consisted of: (1) Permanent transformer locations with necessary switches, fuses, and receptacles; (2) portable air-cooled transformers which are assigned to each camp outfit and installed on railroad primary distribution circuits, (3) special weatherproof receptacles to accommodate the portable cords extending to the camp cars from connection points on secondary distribution circuits or commercial sources of power.

Question 3 inquired as to the use of swivel or flexible fittings at either end of the portable cords to assure that the cable would be automatically disconnected and de-energized in the event camp cars are unexpectedly moved. Only three roads reported the use of such equipment, while fifty reported that they do not use those special fittings.

Because of the importance of safe handling of service connections for camp cars, the questionnaire included as Item 4 (a) a reference to any special instructions to personnel with respect to connecting camp cars to local circuits or supply lines. Fifteen railroads reported instructions of this nature in effect, while 38 railroads stated that no special or general instructions along this line had ever been issued. Those reporting special instructions in effect stated that generally these instructions specify that members of camp car personnel are not permitted to make connections to supply lines and circuits except at approved locations where receptacles and proper fuse or breaker protection is provided. They also report that at locations where portable transformers or special line connections are required, connections can only be made by a qualified employee. Instructions issued by some railroads prohibit the connecting of camp car lights to signal control circuits. One railroad has instructions that the service connection to camp cars must be detached when cars are left unattended.

In order to find out which craft or department is responsible for the proper fusing and the safe performance of the service connections for camp cars, Question 4 (b) was included in the questionnaire. Thirty-four railroads reported as follows:

Electrical Department, Engineering Division	15
Signal Department	6
Telegraph and Signal Department	5
Mechanical Department	3
Telephone and Telegraph Department	1
Signal and Electrical Department	2
Maintenance of Way Department	2

A number of constructive suggestions relative to the proper method of supplying power to camp cars from local circuits were received in answer to Question 5 of the questionnaire. Generally, the suggestions received were in line with the report prepared by Committee 1, in 1946, and which was printed on pages 40 and 41 of the 1946 reports of the Electrical Section. One railroad suggested that the portable cable which extends from the supply point to camp cars be buried to prevent accidental tripping by trainmen and others. A few railroads reported that consideration was now being given to the wiring of camp cars and the question of supply circuits at local points.

An analysis of the information received from the railroads indicates that as a result of varying conditions and circumstances encountered on the different lines and divisions, no standard or uniform arrangement can be followed in all cases in supplying power to camp cars from local circuits. However, the replies are in agreement that basic or fundamental requirements with respect to safety and dependable service should be followed.

The report is signed by C. P. Trueax (*chairman*), assistant electrical engineer, Illinois Central; S. D. Kutner (*vice-chairman*), assistant engineer, New York Central; R. E.

Hauss, electrical designer, Cincinnati Union Terminal; H. A. Hudson, signal and electrical superintendent, Southern; F. A. Rogers, engineer, electric lighting and distribution, New York, New Haven & Hartford; G. L. Sealey, assistant engineer, Reading; C. S. Stringfellow, assistant to electrical engineer, Atlantic Coast Line; W. D. Taylor, electrical engineer, Canadian National; A. L. Veith, assistant electrical engineer, Wabash; and Laurence Wylie, electrical engineer, Chicago, Milwaukee, St. Paul & Pacific.

Discussion

The report was presented by E. M. Hastings, Jr. (R., F. & P.). J. M. Trissal (I.C.) said the American Standards Association has put out new specifications on fibre stresses in wood poles based on test methods different from those used previously, and that there is a difference between A.S.A. and National Electric Safety Code specifications. Paul Lebenbaum (S.P.3, who represents the A.A.R. on this subject, said that before any attempt is made to turn down A.S.A. specifications for those of the N.E.S.C., the matter should be given careful consideration. Mr. Trissal added that he has no quarrel with the fibre stresses as designated, but that to substitute at this time would cause inconsistencies.

Electrolysis

An investigation on the electrolytic corrosion of steel in concrete, has been conducted for the committee by the Engineering Division research staff with funds provided by the Association. This is essentially the final report of the investigation. It is proposed to continue the field test until the summer of 1949 to obtain more severe deterioration of the specimens. However, the extent of deterioration now existing makes it possible to form definite conclusions on the results of tests.

The purposes and progress of the investigation have been discussed in detail in previous reports of the committees for the years 1943-1947, inclusive. Briefly, preliminary inspections of catenary structure footings showing evidence of electrolytic corrosion of anchor bolts, indicated that the presence of water in contact with the concrete was an important factor. Accordingly, a field "laboratory" test was provided in which concrete cylindrical specimens, each containing a steel electrode, were buried in the ground and an electric potential continuously maintained between the electrode and the ground. The first series of tests, continual for about 15 months, were concluded in July 1945, and included specimens to determine the effect of various thicknesses of concrete covering, steel encasement, asphalt membrane waterproofing, cement proportioning, and use of various admixtures. The results showed that the asphalt membrane waterproofing alone effectively eliminated electrolytic corrosion of the steel. Increasing the thickness of the concrete covering, the use of admixtures, or richer mix, or of steel encasement were of no benefit. Of even more interest was the severe concrete deterioration that occurred in the specimens unprotected by steel encasement or asphalt waterproofing. After careful study, it was concluded that this deterioration was due to an accelerated sulfate attack, the specimen acting as an electrode positive to the ground and attracting negative sulfate ions to its surface.

A plain concrete specimen not connected to the power supply showed no evidence of damage

A plain concrete specimen subjected to current flow

To complete the investigation it appeared desirable to make a second series of tests including specimens of the following types:

(a) Sulfate resisting cement to verify the sulfate attack theory.
(b) Plain concrete specimens with and without current to establish a base for comparisons.
(c) Specimens with stainless steel electrodes.
(d) Completely steel-encased specimens—in the first series the concrete was exposed at the bottom end.
(e) Specimens with emulsified asphalt added to the concrete mix.
(f) Specimens in which the concrete was poured into forms which had been lined with asphalt membrane waterproofing. In practice it would generally be impractical to apply the waterproofing after the concrete was poured.
(g) Specimens having only the electrode coated with asphalt.
(h) Specimens with a wire mesh between the electrode and the surface to simulate the condition of anchor bolts surrounded by reinforcing steel.

The specimens for the second series of tests were poured August 30, 1946, at the Illinois Central 27th Street shops. The forms were stripped September 5 and 6, and the specimens were placed in the ground at the 23rd Street test site beginning September 9, 1946. A potential of 25 volts direct current was applied October 8, 1946, and initial current flow readings were taken as shown in Table 1. The steel electrode in each specimen was connected to the positive side of the line, and four rails buried at each corner of the test site were connected to the negative side.

Specimen protected by asphalt membrane water proofing

Results of Tests

Readings of the current flow through each specimen were taken periodically. On June 8, 1948, a trench was excavated at each specimen to observe the condition of deterioration. Four of the representative specimens included in the test are shown in the photographs. The results of the current flow as given in Table 1 and the observed condition of the specimens on June 8, 1948, permit the following observations:

1. The plain concrete specimens which were not connected to the line voltage showed no evidence of cracking from electrode corrosion or deterioration of the concrete.

2. The plain concrete specimens which were subjected to current flow were badly cracked due to the expansive forces set up by corrosion of the electrode, and the concrete showed definite surface deterioration underground.

3. The specimens made of sulfate resisting cement were in considerably better condition than the plain concrete specimens. Two specimens were in excellent condition; one showed cracking and some deterioration underground. Since the amount of current flow was about the same as for the plain concrete, cracking of the specimens would be expected. A substantial reduction in the extent of concrete deterioration underground was noted, which conforms to the theory of sulfate attack. For these specimens the cement was of ASTM Type II composition with 0.015 Vinsol resin solution added at the mixer to give air entrainment.

4. The specimens containing wire mesh showed cracking and underground deterioration but to a less extent than the plain concrete specimens. The wire mesh probably tended to hinder cracking somewhat. In view of the amount of current flow, however, a considerable underground deterioration would be expected.

5. All three types of stainless steel electrodes included in the tests effectively prevented cracking of the specimens since the expansive forces from corrosion were eliminated. However, there was no reduction in current flow and consequently, there was surface deterioration of the concrete underground.

6. The asphalt membrane waterproofing into which the concrete was poured effectively prevented current flow and, although the membrane was not removed, it seems safe tc assume from the first series of tests that cracking and deterioration were also prevented.

7. Coating the electrode with asphalt was just as effective in preventing current flow, cracking and surface deterioration underground. Tests have not been made to determine the effect of the asphalt on the bond strength, between the steel and concrete, but it is presumed that the bond would be greatly reduced and that if the asphalt coating were used (as, for example, on anchor bolts) it would be necessary to provide a hook or plate on the embedded end.

8. The specimens encased in steel pipe were in fair condition. Small radial cracks extended from the electrode, but the steel encasement restrained them from further development. These specimens exhibited peculiar behavior in the current flow. The current was relatively large initially in all three specimens and for one of them (No. 26) gradually rose to 5.80 amp. and then dropped to a nominal value. The February 18, 1948 readings showed relatively low current, but

Coating the electrode with asphalt was just as effective as the outside membrane coating in preventing deterioration

the values increased again for the final set of readings. It is presumed that changes in moisture content of the soil are primarily responsible for the current fluctuations that occurred in all specimens.

9. The addition of emulsified asphalt to the concrete did not increase its electrical resistance as was hoped and the specimens were badly cracked and deteriorated underground.

Conclusions

As a result of the investigation and field tests, the following conclusions and recommendations are presented pertaining to electrolytic corrosion of steel in concrete where the concrete is embedded in the earth and subjected to a constant or intermittent electrical potential:

(a) Alternating current potential does not produce electrolytic corrosion of steel in concrete nor deterioration of the concrete.

(b) Direct current potential (with the steel and concrete anodic) will produce electrolytic corrosion of steel in plain concrete, cracking of the concrete, and deterioration of the concrete if it is in contact with soil containing sulfate ions, providing there is sufficient current flow.

(c) Electrolytic corrosion of steel in concrete, cracking of the concrete, and deterioration of the concrete underground may best be prevented by surrounding the concrete with asphalt membrane waterproofing to insulate it from the ground or by coating the steel with asphalt to insulate it from the concrete. The concrete may be poured into forms lined with the waterproofing or the waterproofing may be applied to the finished concrete. Should the steel only be coated then all steel tending to discharge current to the concrete must be coated. For example, in a foundation for a catenary structure, the anchor bolts and that portion of the catenary structure bearing directly on the concrete must be coated. Reinforcing steel used within the footing need not be coated.

(d) The passage of electric current through concrete does not in itself produce concrete deterioration.

(e) The use of richer mix or any of the admixtures included in the tests, including emulsified asphalt, were not effective.

(f) The use of stainless steel will greatly lessen the corrosion and cracking, but will not prevent concrete deterioration underground if sulfate ions are present in the soil.

(g) The use of sulfate resisting cement is helpful in preventing concrete deterioration underground, but will not prevent corrosion of the steel and resultant cracking of the concrete.

The report is signed by A. E. Archambault (*chairman*), assistant engineer, New York Central; H. P. Wright (*vice-chairman*), assistant electrical engineer, Baltimore & Ohio; Paul Lebenbaum, electrical engineer, Southern Pacific; A. Z. Mample, assistant to lines engineer, Western Union Telegraph Company; F. B. McConnel, assistant signal electrical engineer, Pittsburgh & Lake Erie; W. A. Moore, general superintendent, electric transmission & communication, New York, New Haven & Hartford; J. M. Trissal, superintendent communication and electrical engineer, Illinois Central; S. M. Viele, assistant engineer, office of electrical engineer, Pennsylvania; E. H. Werner, assistant electrical engineer, Virginian; and Laurence Wylie, electrical engineer, Chicago, Milwaukee, St. Paul & Pacific.

Discussion

The section of the report on research was presented by G. M. Magee, research engineer, research staff, Engineering Division, A.A.R.

L. Leisenring (I.C.) asked if the investigators had tried the conventional wrapping frequently used on underground pipe. Mr. Magee answered that they had not, but that asphalt not only acted as an insulator, but also kept moisture from the concrete. In response to a question by C. A. Williamson (T. & N.O.), Mr. Magee said that deterioration of the concrete was not due to sulfate, but that the splitting of the concrete was caused by corrosion of the metal.

The remainder of the report was presented by Chairman A. E. Archambault (N.Y.C.). In his presentation, he said that electrodeless protection accelerated corrosion rather than retarded it. He also said that electrodes of magnesium alloy have given very good protection.

J. M. Trissal (I.C.) referred to the section meeting held two years ago, at which serious doubts were expressed concerning the merits of electrodeless protection. These doubts, he said, had now been vindicated.

Wire, Low Voltage Cable and Insulating Material

The committee is of the opinion that the specifications of the Signal Section for low voltage, rubber-insulated wire and cable could well be adopted by the Electrical Section by title reference insofar as they apply. The specifications which are recommended for Electrical Section use are E89-40, E90-40, E91-40, E111-40, E145-40, and E161-40. Specifications E182-40, E191-40 are specifications for braids for use with the above specifications where braids are required for indoor and outdoor service. The tabulation indicates the type and construction for the several specifications listed above.

Adoption by the Electrical Section could be made by replacing the present Manual material with sheets describing the type of cable.

Specifications for single conductor, rubber-insulated lead-sheathed cable for 0-600 volts are covered by Signal Section Specification E91-40, Thickness C, with the following changes:

Stranding of cable sizes larger than No. 4/0 AWG shall be in accordance with A.S.T.M. designation B 8, Class B concentric lay cable.

Thickness of insulation for sizes larger than No. 4/0 AWG shall be in accordance with A.S.T.M. designation D27, 0-600 volts.

Thickness of sheath for sizes larger than No. 4/0 AWG shall be in accordance with current American Standard C8.15.

Improved Insulation Materials

The report states that among the most prominent developments in improved electrical insulations are Polyethelene and Polyvinalchloride. Polyethelene has justified its use in high frequency applications but its use for other installations has not been wide enough to demonstrate all its other possibilities. Subcommittee V of A.S.T.M. Committee D-11, is now preparing a specification for this type of insulation.

Polyvinalchloride has also demonstrated its applicability for certain types of installations but until such time as experience has demonstrated the most advantageous use for this type of insulation, the committee suggests that it be employed with some caution and in accordance with manufacturers' recommendations.

Both the above types of insulation and also Neoprene have been applied in limited quantities as substitutes for weather-resistant fibrous coverings on hard drawn line wire.

Specifications for Asbestos Duct

The committee prepared Specifications for Asbestos-Cement Conduit, which were presented on pages 38 to 43, inclusive, of the 1939 committee report pamphlet. These proposed specifications were acceptable except for a change in Paragraph D-4, Boiling, on page 39. It was suggested that this paragraph be changed to correct for boiling point of water at different altitudes. This can be done by deleting reference to 212 deg. F., and paragraph D-4 should read:

D-4—Boiling: Boiling a sample of conduit for one hour in water shall produce no evidence of separation into layers, or disintegration.

It is recommended that these specifications be adopted for publication in the Manual.

The report is signed by C. R. Troop (*chairman*), assistant engineer, New York Central; G. L. Sealey (*vice-chairman*), assistant engineer, Reading; E. R. Ale, office of electrical engineer, Pennsylvania; L. S. Billau, electrical engineer, Baltimore & Ohio; L. L. Carter, assistant chief engineer, Anaconda Wire & Cable Company; A. E. McGruer, electrical engineer, Canadian Pacific; P. W. Pleasant, electrical supervisor & chief fire inspector, Chicago, Indianapolis & Louisville; R. F. Pownall, superintendent electric transmission, New York, New Haven & Hartford; and C. P. Taylor, electrical engineer, Norfolk & Western.

Suspended Monorail System

A special feature of the meeting was a paper on the suspended monorail system of urban and inter-urban transportation system which was presented by E. H. Anson, vice president, Gibbs & Hill, Inc., Consulting Engineers, New York, N.Y. An article on this system was published in the April, 1948 issue of *Railway Mechanical Engineer*. A discussion prepared by C. M. Davis, Manager, Transportation Engineering Division, General Electric Company, Schenectady, N.Y., was presented by C. C. Bailey, Manager, Transportation Division, General Electric Company. A prepared discussion was also presented by H. E. Dralle, Westinghouse Electric Corporation.

In response to a number of questions asked from the floor, Mr. Anson replied that he was not promoting this system, but was simply presenting an engineering discussion. In his opinion, the reason the monorail system has not received acceptance since the original German installation, is that many engineers have proposed impractical plans and given the public the impression that no system is practical. It is his opinion that a monorail system can be constructed for about 25 per cent of the cost of a subway, exclusive of rolling stock.

Corrosion-Resisting Materials

A report on corrosion-resisting materials, which was not available for printing before the meeting, was presented by L. B. Curtis, office engineer, c/o electrical engineer, Pennsylvania. The report deals with protective coatings for catenary construction. Four different coatings were tried and one, consisting of a priming coat of red oxide

of lead, and a supplementary coat made with cottonseed gum proving to be the best of the four. Under test it failed after three years, under direct influence of locomotive gases, but away from the gas, it was satisfactory. It is recommended that it be replaced at two year intervals where locomotives stand.

Discussion

S. R. Negley (Reading) asked if the coating would be good for catenary structures. Mr. Curtis replied that since it required heating, its application involves some difficulties. He added that, in his experience, a coating of red oxide lead under aluminum, a second coating of aluminum,being applied to lower surfaces, had given good results and that it was necessary to repaint only about every ten years.

Electric Heating and Welding

The committee offers as information a report of several items on applications of electric heating to maintenance of way and structures problems.

Electric Switch Heater Installation

The Chicago Rapid Transit Lines electric switch heater installation at the Merchandise Mart Station, which is of interest in view of the low wattage value, had been found adequate under the conditions imposed.

This installation consists of ⅝-in. diameter heater tubes 22 ft. long, applied two in series on 600 volts d.c. at each of four No. 5 turnouts with 12-ft. switch points. The supply circuit for heaters is picked up at the third rail, run through a remotely controlled contractor to the heaters, with the circuit terminating at the grounded rail. There is only one heat of 250 watts per foot which has proved to be excessive for continuous operation.

There is a main fuse installed at the contactor, with individual fuses for each switch group in a distribution box centrally located with reference to turnouts.

The conditions under which this installation operates can perhaps be considered as somewhat less severe than those under which the electric switch heaters operate on the average railroad. The location is surrounded by tall buildings and is elevated above ground on a steel structure so that some portion of the snow falls between the ties to the ground, rather than settling on the switch points.

Electric Heater Installations for Coaling Stations

Electric heating to prevent freezing of wet coal in bins of coaling stations was used at various points on the Illinois Central Railroad, Northern Lines, during the winters of 1946-1947 and 1947-1948.

An early type of installation using strip heaters reduced the amount of trouble due to the freezing of coal in coaling stations, but during severe cold and strong wind, wet coal would still freeze, causing train delays.

During the winter of 1947-1948, the coaling stations at Springfield and Mt. Pulaski, Ill., were equipped with an insulated wooden enclosure around the bottom of bins enclosing heaters and a thermostat. There were no freeze-ups at these coaling stations during the winter 1947-1948, and it is believed that a considerable saving in energy was achieved due to this housing.

A proposed bin bottom heater housing contemplated for the method of enclosing heaters on future coaling stations is illustrated in the report. This plan is also being considered for existing coaling stations.

Electric Track Switch Heater

Following is a description of the electric track switch heaters installation at Holmes Interlocking, Holmesburg, Pa., on the Pennsylvania Railroad electrified main line between New York and Philadelphia. The installation was developed after obtaining a considerable amount of test data to determine the capacity of the substation and circuit layout. This is one of the most recent installations and represents modern practice.

Substation

Power supply is obtained through two unit substations, each consisting of one 333-kva., single-phase, 25-cycle o.i.s.c. transformers, with 12,000-volt primary and 480-360-240-volt secondary. Each transformer is protected by a 100-amp. fuse and a lightning arrester on the primary side. Power is supplied from the 12,000-volt overhead catenary system, through a 400-amp., 15-kv., remote-controlled, motor-operated disconnect switch. On the secondary side of each transformer are three 800-amp., 600-volt, 25-100-cycle, remote-controlled circuit breakers, one in each tap, designated "High," "Medium" and "Low." These breakers feed a common bus and are mechanically and electrically interlocked, so that only one breaker may be closed at one time. Six heater circuits are fed from a common bus, each through a 125-amp., 600-volt circuit breaker. Five of these circuits run direct to track switch heaters. The sixth feeds an "out" bus, from which four circuits run to the switch heaters, each through a 125-amp., 480-volt circuit breaker. It will be seen that this provides a properly co-ordinated cascade arrangement of circuit breakers. The entire operation is remote-controlled from Holmes Tower.

Switch Heaters

A total of 32 electric strip track switch heaters is installed in the interlocking plant, 28 of which are 48 ft. long overall, with 46 ft. of effective heat, and 8 are 22 ft. long overall, with 21 ft. of effective heat. All are 500 watts per foot at 480 volts, 300 watts per foot at 360 volts, and 125 watts per foot at 240 volts.

The report is signed by C. A. Williamson (*chairman*), electrical engineer, Texas & New Orleans; E. B. Hager, assistant engineer, Illinois Central; F. A. Rogers, engineer, electric lighting and distribution, New York, New Haven & Hartford; C. S. Stringfellow, assistant to electrical engineer, Atlantic Coast Line; L. J. Verbarg, chief electrical engineer, Missouri Pacific; R. C. Welsh, foreman, office of electrical engineer, Pennsylvania; E. H. Werner, assistant electrical engineer, Virginian; and R. P. Winton, testing engineer, Norfolk & Western.

J. C. McElree, who had been vice-chairman of the committee for several years, retired from his position as electrical engineer, Missouri Pacific, during the past year.

Discussion

The report was presented by C. A. Williamson (T. & N.O.) and E. B. Hager (I.C.). Mr. H. P. Wright (B. & O.) said that most switch points are reinforced and that much of the reinforcing must be removed to permit installation of the heater. He asked if this was considered objectionable. Mr. Williamson said that the committee has received suggestions that the flattened type of heater be tried. W. D. Taylor (C. N.) said that his railroad is now using heaters of oval cross-section with 500 watts per foot. These, he said, work very satisfactorily, and that the snow just doesn't get a chance

Illumination

The first part of the report is devoted to developments in electric lighting of interest in the railroad field. These include reflector lamps, fluorescent lamps and mercury lamps. The new reflector lamps are as follows:

The 300-watt, R-40, and the 150-watt, PAR-38 reflector lamps are now available with heat-resistant glass bulbs, making them suitable for outdoor service with a minimum of breakage due to water or similar cooling agents.

The 150 and 300-watt, R-40 lamps are available with skirted mechanical bases for use in types of apparatus in which the base temperature may exceed 345 deg. F. These lamps are ¾ in. longer than similar lamps having cemented bases.

The 150-watt, PAR-38 lamp is now available with prong contacts in the side of the base, like an attachment plug. It is for use where space is not available for a lamp of greater overall length, for example, when used as a spotlight in conjunction with fluorescent fixtures. The overall length is reduced about one inch.

Fluorescent Lamps

A 12-in. T-8 lamp is available for operation at 13 watts on alternating current, or 14 watts on 60 volts direct current. It is expected to be used in car lighting or in positions where space is not sufficient for a lamp of greater length.

T-12, 40-watt lamps designed for instant starting, in 4,500 deg. white, 3,500 deg. white, and daylight, are available. They may be had with the starting stripe for facilitating operation under conditions of low temperature or high relative humidity, or in areas in which voltages below normal starting value may be encountered. For relatively stable, average conditions, these lamps may be had without the starting stripe.

There is also available a 40-watt, 60-in. T-17, "instant start" lamp, with starting stripe, which has the same lumen output as the 47-inch., 40-watt, T-12 lamp. Due to its greater radiating area, the surface brightness is about 55 per cent of that of the T-12 lamp. It may be had in 4500 and 3500 deg. white.

The 100-watt, 60-in. T-17 lamp has been so redesigned that it now consumes only 85 watts, gives light output equal to the original 100-watt lamp, and is operable with 100-watt ballasts and fixtures.

Fig. 3—Diesel locomotive shop, Harrisburg, Pa., night view along pit—low bay section

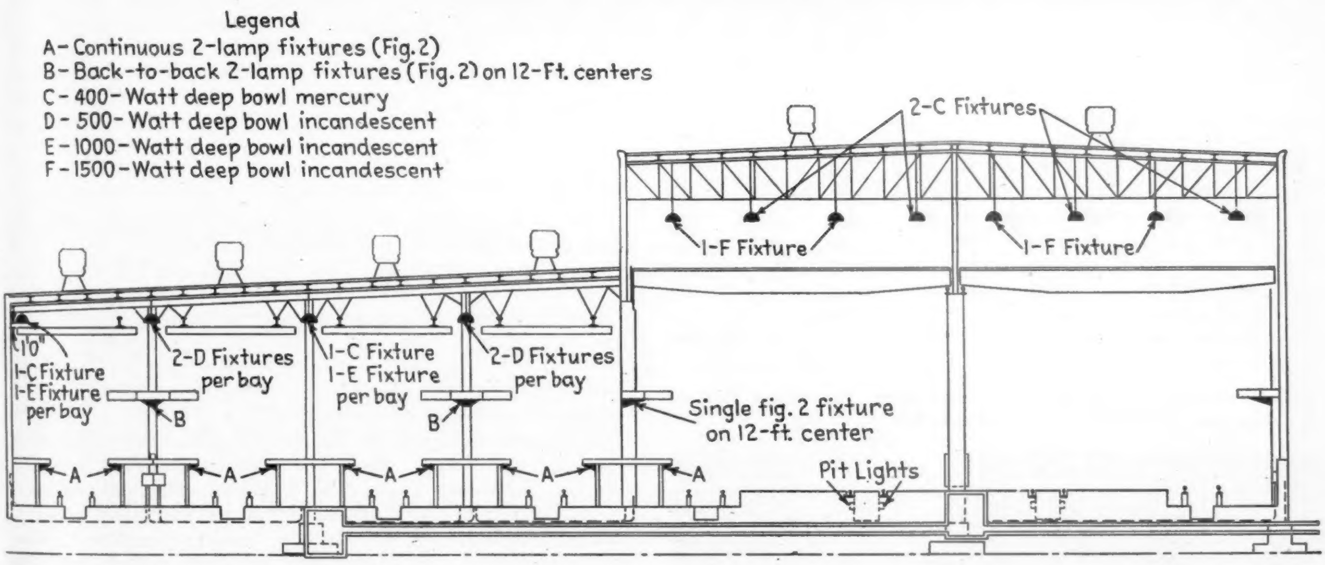


Fig. 1—Cross section of Diesel locomotive shop at Harrisburg, Pa., showing lighting facilities

Mercury Lamps

A new E-H1, 400-watt mercury lamp in a T-20 bulb has been developed to replace the E-H1, 400-watt lamp in a T-16 bulb. This new lamp, due to its greater bulb surface, radiates heat more rapidly and is better adapted to operation in totally enclosed fixtures. Its output is 21,000 lumens and its purchase price is somewhat more than double that of the T-16. The T-16 lamp, at 16,000 lumens, is satisfactory for use in open type fixtures.

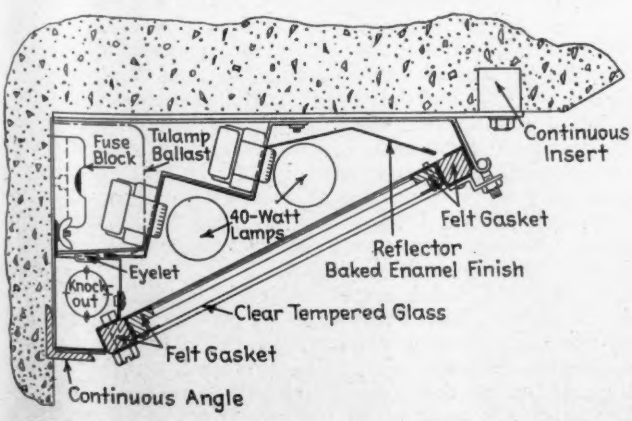


Fig. 2—Cross section of mounting of two-lamp fluorescent fixtures under the lower platform

Lighting of Diesel Locomotive Terminal Facilities

Presented in the report are photographs, sketches, and a description of the lighting facilities in the Diesel locomotive shop of the Pennsylvania Railroad, at Harrisburg, Pa. In designing this installation, considerable advantage was derived from the fact that this shop was erected from scratch and there was no necessity for utilizing or adapting existing material.

The lighting fixture arrangement is as shown in Fig. 1, which depicts a cross-section of the shop. The overhead fixtures suspended from the roof, are specially designed, deep bowl, RLM type, equipped with dust-tight, clear tempered glass covers. They are arranged for the reception of 500, 1,000 and 1500-watt incandescent lamps, or 400-watt mercury lamps. Details of design are as described in the 1947 report on the East Altoona enginehouse. This was published in the November 1947 issue of *Railway Mechanical Engineer*.

Lighting for the sides and running gear of the locomotives is accomplished by specially designed fixtures equipped with two 40-watt fluorescent lamps. A cross section of these fixtures is shown in Fig. 2. They had to be designed to occupy as little space as practicable, so as not to interfere with the activities of workmen, and to present no avoidable hazard.

The clear, tempered glass cover is mounted in a carefully gasketed frame which is held in close position by slotted

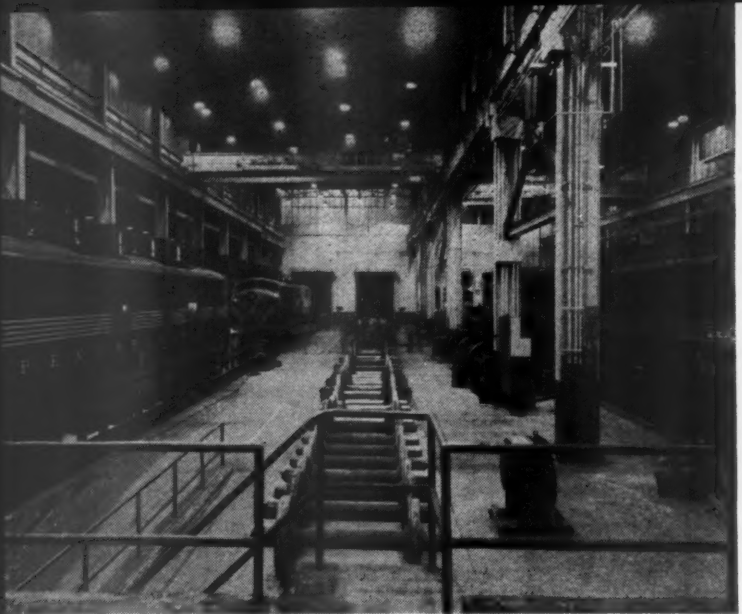


Fig. 4—Diesel locomotive shop, Harrisburg, Pa., general night view—high bay section

cap bolts. From the open position, the complete cover may be lifted off the fixture without the use of tools. Adjustment is provided at the hinge side, so that the felt gasket may always be snugly contacted.

The reflector is steel with a baked enamel reflecting surface. Tulamp ballasts are used and a fuse is provided on the line side of the ballast to open the circuit in case the ballast should develop serious trouble.

The wiring channel is self-contained, being formed by the lower back corner of the fixture, and a removable cover equipped with dust-proof grommets for passage of the wires. Knockouts afford access to the wiring channel.

When two or more fixtures are mounted in a continuous run, a dust-tight wiring channel connection between fixtures is made by means of a chase nipple, lead and steel washers, and a locknut.

Fig. 5—Diesel locomotive shop, Harrisburg, Pa., night view—running gear illumination, 40 foot-candles

Wiring is carried in conduit, the joints of which are leaded. The conduit is coated with the paint used on the inside of the shop. Corrosive fumes are not anticipated.

In the low bay section, the longitudinal spacing of the overhead fixtures is 12 ft. In the high bay section, the longitudinal spacing is 20 ft., the rows being 12 ft. apart, and fixtures in adjacent rows are staggered.

Under the roof level platform are mounted two 2-lamp fluorescent fixtures (Fig. 1) back-to-back, on 12-ft. centers, for illumination of the locomotive sides and the floor level platform. Under the floor level platform are continuous rows of 2-lamp fluorescent fixtures (Fig. 2) for lighting the running gear and floor.

Following are average illumination values found after six months in service:

LOW BAY SECTION

Location	Footcandles
High level platform	14
Low level platform	14
Top of locomotive	14
Cab side	30
Running gear	40
Floor between locomotives	30

HIGH BAY SECTION

Location	Footcandles
Top of locomotive	26
Side of locomotive	26
Top of locomotive	24
Interior of locomotive with hatch off, hand height	23

Maximum and minimum values vary but little from the averages shown.

Figures 3, 4 and 5 show views inside the shop. No pit lights are necessary in the low bay section.

Yard Lighting

A section of the report devoted to the lighting of yards and shop grounds describes the newly installed lighting of car passenger servicing tracks in the Cincinnati Union Terminal. This installation was described in the August, 1948 issue of *Railway Mechanical Engineer*.

The report is signed by E. R. Ale (*chairman*), office of electrical engineer; L. S. Billau (*vice-chairman*), electrical engineer, Baltimore & Ohio; V. R. Hasty, electrical engineer, Union Pacific; H. A. Hudson, signal and electrical superintendent, Southern; S. D. Kutner, assistant engineer, New York Central; F. B. McConnel, assistant signal electrical engineer, Pittsburgh & Lake Erie; A. E. McGruer, electrical engineer, Canadian Pacific; G. L. Sealey, assistant engineer, Reading; W. D. Taylor, electrical engineer, Canadian National; and C. A. Williamson, electrical engineer, Texas & New Orleans.

Participation with A.S.A.

Representatives of the Electrical Section take part in the work of a number of the sectional and special committees of the American Standards Association.

In June 1948, members of A.S.A. Sectional Committee 05 received copies of American Standard Specifications and Dimensions for Wood Poles 05.1-1948, approved as of April 9, 1948. It supersedes the previous American Standards 05.a and 05.1 to 05.6, and the American War Standard 05.7. The standard recommends specifications for and dimensions of wood poles that are to be given preservative treatment, and was adopted, after many years of work, by an almost unanimous vote of the committee. Copies of American Standard Specifications and Dimensions for Wood Poles, 05.1-1948 may be obtained from the American Standards Association, 70 East 45th Street, New York 17, N. Y.

In July 1944, A.S.A. organized Special Committee J6 under the so-called "War Procedure" to prepare any necessary specifications covering the various items of linemen's rubber protective equipment then being produced, to assist in the allocation of the then very scarce natural rubber. This war committee was made up of representatives of all interested parties and associations, H. F. Brown, engineer of electric traction, New York, New Haven & Hartford Railroad, being

the representative of the Electrical Section, Engineering Division, A.A.R.

The work of this committee resulted in A.S.A. War Standards J6.1, 2, 3, 4 and 5-1945, covering Specifications for Linemen's Rubber Protective Equipment: line hose, insulator hoods, leather protective gloves, rubber blankets, and sleeves. The committee recommended that A.S.A. Specifications C59.12-1942 for electrical gloves made of natural rubber be left unchanged, as the saving in natural rubber used in their manufacture was too small to warrant a change in the specifications.

In January 1947, it was decided to continue ASA Committee J6 on a peacetime basis and Mr. Brown was asked to continue to serve as the A.A.R. representative on the committee. One meeting of the reorganized committee has been held and it was agreed to review the war-time specifications and revise them, if necessary, to conform with the requirements for materials again available under current conditions. Mr. Brown will continue to serve on this committee and will report to the section from time to time.

Discussion

The report was presented by E. R. Ale (P.) and R. E. Hauss (C. U. T.). In his presentation, Mr. Ale, said that 40 footcandles seems like a lot of light, but that cost and intricacy of work done amply justify such a lighting installation. Management, he said, is beginning to appreciate that the work done benefits materially by improved lighting.

Electrical Section, Mechanical Division

Election of Officers

Officers elected to serve during the coming year are as follows: Chairman: L. S. Billau, electrical engineer, Baltimore & Ohio; First Vice Chairman: F. O. Marshall, assistant chief engineer, Pullman Company, Chicago; Second Vice Chairman: W. S. H. Hamilton, equipment electrical engineer, New York Central; Member of Committee of Direction (West): R. I. Fort, assistant research engineer, Illinois Central; and Member of Committee of Direction (East): C. W. Nelson, electrical engineer, Chesapeake & Ohio.

Automotive and Electric Rolling Stock

Lubricating Oil Reclamation

The subcommittee dealing with the questions of lubricating oil reclamation and the use of additives considers the subject too controversial to permit recommendations for this manual at this time, and has confined its activities in both its 1947 and 1948 report to submitting questionnaires to the railroads.

Oil Tests That Show Engine Conditions

At the 1947 convention it was suggested that a report be made on the method of lubricating oil analysis used by the Denver & Rio Grande Western, employing a spectograph photometer. A brief article on its methods and interpretations follows:

With the coming of the first Diesels on the railroad, the Denver & Rio Grande Western found that specialized lubricating oils were necessary. These, for the most part, contain additives to improve engine performance, to prevent excessive sludging, to prevent carbon formation, to prevent corrosion, to prevent oxidation, etc. It was felt that these specialized oils required new testing techniques, and the spectographic analysis of these new oils was introduced, leading to amazing results.

When the Diesels were first purchased, the recommended oil change period was 25,000 miles. With the present methods of analysis, there is no limit to mileage, the average being 100,000 to 200,000 miles and the change is made then usually for the purpose of mechanical overhaul. The oil is then reclaimed and reused.

For the purpose of adequately testing new oils before and during purchase, a spectrographic analysis is made in the

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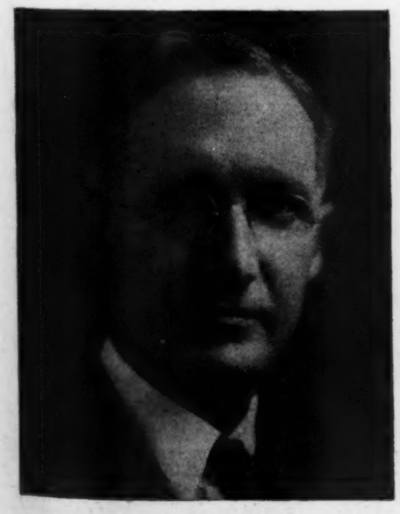
Electrical Section, Mechanical Division, Association of American Railroads

Officers

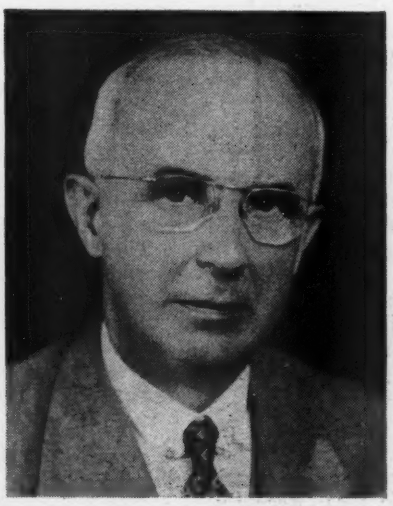
J. E. Gardner, *Chairman,* Electrical Engineer Equipment, Chicago, Burlington & Quincy, Chicago.

L. S. Billau, *First Vice Chairman,* Electrical Engineer, Baltimore & Ohio, Baltimore, Md.

J. A. Andreucetti, *Secretary,* Electrical Section, Mechanical Division, A. A. R.



J. E. Gardner



J. A. Andreucetti

L. S. Billau

laboratory. In the same manner, oil samples from engines in service are made monthly. From these analyses, an excellent picture of what is taking place in each engine becomes evident. In addition to increasing the life of the lubricating oil, the use of this type of analysis has increased the life and performance of the engines themselves.

The spectrographic equipment used consists of a Littrow type quarts prism mounting spectograph, a non-recording type Baird densitometer, and a Dietert A.R.L. type direct current arc control. The range used for these analyses is from 2,500 to 3,400 Angstrom units.

In carrying out the tests, oil samples for study are first ashed in a porcelain crucible, a process requiring special technique in that the rate of burning, the ignition temperature, and amount of oil taken for the sample must be carefully controlled. The special care in preparing the ash for the analysis was found to be necessary in the laboratory experimentation. The ash is weighed and the amount determined. The weighed ash is compared with that of a weighed ash of a new oil sample. An increase in ash indicates a gain due to engine conditions. Such an increase then requires an analysis by the spectrograph.

If a spectrograph analysis is required, a proper sample is then taken from the porcelain crucible, transferred to an agate mortar and carefully ground, taking care that the sample and mortar are free from contamination. The sample is then taken from the mortar, using a calibrated measuring rod and placed in a crater type, specially designed carbon electrode. The sample is then burned in the arc. Three consecutive spectrographs are then photographed automatically, using 20 seconds for each exposure without the arc being shut off.

The spectrograms are then developed in a few minutes and studies are made of them in a specially lighted examining unit. For quantitative analyses, calculations are made from the study of the spectrograms on the Baird densitometer.

A study of the spectrograms of new oils shows the amount of additives present in the oil, their type, and also any other residual elements present which may be the result of improper refining. For example, they found one sample of new oil which contained refinery filter clay, an abrasive. The oil was rejected as a result of the analysis.

A study of the spectrograms of samples of oil removed at periodic intervals from engines in service, show other elements in the oil which may be present, due to factors to be found in the engine operation.

When an abnormal amount of iron is found in the oil, a check of the engine may show excessive wear of rings due to wrong type of assembly, which would wear liners and rings and eventually result in failure, and then the cause of failure would be hard or impossible to find.

Excessive wear on bearings will usually be indicated early by the presence of elements in increasing amounts of the bearings materials, such as copper, silver, lead, etc.

Dirty or inoperative air filters will show an abnormal presence of the elements aluminum, magnesium, silicon and titanium in the spectrograms.

It is necessary for the technicians in the laboratory to have a knowledge of the material used in the construction of engine units and a good knowledge of the elements present in the new oils used, in order that comparisons may be made between new and used oil samples.

When used oil samples show elements foreign to the oil, mechanical department supervisors are then informed of their presence, and information is given them concerning the probable offending parts creating the condition. Thus, conditions of improper maintenance or excessive wear can be determined quickly and corrected before serious damage is done.

On the Denver & Rio Grande Western the spectrograph analysis is in charge of a chemical engineer in the testing and research laboratory, under the supervision of the chief chemist and the engineer of standards and research.

Mixing of Lubricating Oils

The mixing of lubricating oils in Diesel crankcases is an extremely controversial subject. In the past so much taboo has existed on even the thoughts of mixing crankcase oils that it was more or less considered an impossible idea. Recently, however, due to conditions of the petroleum products market most railroads are forced to use a number of different brands of Diesel lubricating oil. From this unfortunate situation of using a multiplicity of kinds of Diesel lubricating oil has come the demand for more information on the subject of mixing of oils.

The principal advantage of being able to mix oils in storage or in Diesel crankcases is the simplification of the facilities for storing, handling, and supplying oil to the various engines. The difficulties of supplying, for example, five kinds of lubricating oil at one terminal are obvious, as are the difficulties of insuring that a certain engine gets the specific kind of oil that is intended for it.

The principal disadvantages are as follows:

1. Whether or not satisfactory lubrication can be obtained with mixing oils. This is a subject upon which very little information has been made available and is a subject into which a thorough investigation must be made. At the convention of the Mechanical Division held in Chicago in June, 1948, it was strongly recommended that this sort of an investigation be properly made by representatives of the Association of American Railroads, the Society of Automotive Engineers, and technicians of the petroleum industry.
2. The use of several kinds of lubricating oil in one crankcase would divide the oil companies' respective responsibilities, or might cancel them out completely.
3. The mixing of lubricating oils having non-similar viscosity indexes might make a difficult situation for the usual shop tests using visgages, since the viscosity base upon which dilution is judged would be variable.

In summarizing, it might be said that considerable research must be done and/or much more complete information must be made available to the railroads before the practice of mixing of oils can be universally recommended.

Along this line, however, it might be stated that during World War II both the Army and Navy procured on specification, additive type lubricating oils which were required to be compatible and miscible. Oils were stored and used under Navy designating numbers, irrespective of manufacturer, with satisfactory performance. Also, at the present time at least two of the major mid-west oil companies supplying Diesel lubricating oil to the railroads have stated their willingness to permit their oils to be mixed with any other Diesel lubricating oil of good reputation, provided that the producer of the latter oil will agree likewise. The fact that these two major companies will agree to the mixing of lubricating oils under certain conditions, and the fact that the Army and Navy have done so for some time, would indicate that the subject of mixing of Diesel lubricating oils is not a negatively closed subject.

It is recommended that the assignment be continued, with special emphasis on the fortification of reclaimed oil, use of reclaimed oil, and the performance of mixed additive type oils in Diesel engine crankcases.

Nickel-Cadmium Starting Batteries

The use of the Nickel Cadmium type of battery in Diesel locomotive service is still in the experimental stage of its development. Reports have been received of four batteries of this type in service on two railroads, two sets being used on 1,000-hp. and two sets on 660-hp. Diesel-electric switching locomotives. The two 1,000-hp. and one 660-hp. locomotive have a nominal 130-volt auxiliary system and use 88 cells of battery, while the other 660-hp. locomotive has a nominal 75-volt system, with 48 cells of battery. The voltage of the auxiliary circuit is regulated at 129-131 volts for the nominal 130-volt system, and 72-74 volts for the nominal 75-volt system, or approximately 1.5 volts per cell.

The 48-cell, nominal 75-volt battery is assembled in twelve 4-cell trays, occupying approximately the same space as the 32-cell, 420-amp.-hr. lead-acid batteries used in Diesel locomotive service. However, the overall height of these cells is 23 in., as compared to approximately 19 in. for the lead-acid batteries. The electrical characteristics of this battery for various discharge rates is as follows:

Rated capacity ampere hour	Amperes discharge to 1.10 volt per cell (equivalent to 1.75 volt for lead-acid cell) 78 deg. F electrolyte					
	8 hr.	6 hr.	4 hr.	2 hr.	1 hr.	1 min.
225	31.5	40.5	54.2	90	149	900

A 5-second ampere discharge to 0.6 end volts per cell (equivalent 1.0 volts for lead-acid cell) 2,940 amperes.

Operating performance has been satisfactory under all conditions of outside temperature. Two of these batteries were placed in service in September, 1947, and two in January, 1948. Only two of them have required flushing since being placed in service, after a period of six months for one, and seven and a half months for the other, indicating that the charging voltages have not resulted in excessive over-charging.

The only trouble experienced with one of the batteries was that due to the collection of dirt and moisture at the base of the cells, they became corroded, which situation was corrected by improving the method for installing the batteries in the compartment.

As batteries of this type belong to the class of long life batteries, it will require several years of service before their merits can be demonstrated.

Battery Charging Control

Last year's report furnished information showing the large variation in charging rate of lead storage batteries, due to changes in electrolyte temperature for any given charging voltage. As a consequence increases in temperature of the battery result in a higher charging rate, which results in further heating of the battery, with the consequence that the life of a storage battery may be seriously shortened unless the charging rates of the battery are closely supervised.

Voltage regulators for the auxiliary generators on Diesel electric locomotives require manual adjustments to establish the proper charging voltage for the various service conditions in which the locomotives operate, also to meet the summer and winter weather conditions. The most practicable means for determining whether or not batteries are over-charged is to maintain a record of the amount of water it is necessary to add to keep the electrolyte at the proper level. With the increasing number of Diesel locomotives in service, particularly in road operation, the maintaining of such records becomes increasingly difficult.

It is therefore apparent that there is a need for better means of automatically controlling the charging of storage batteries in Diesel locomotive service, particularly to prevent charging rates which result in high battery temperatures, resulting in shortening of battery life. The most practicable means for accomplishing this is the use of thermostats or thermal compensating relays, so located as to measure as nearly as practicable the temperature of the battery, and which at predetermined temperature rise will reduce the charging voltage until temperature conditions become normal.

There has been a very considerable amount of experimenting done with this general type of control over a period of several years on storage batteries in passenger car service, using a number of types of equipment and methods of application. Results that have been obtained have been very satisfactory in reducing excessive over-charging of batteries, as indicated by reduction in amount of flushing necessary. No control equipment of this type is at present commercially available, nor has it been tried out for battery control on Diesel locomotives, although some experiments in this connection are under consideration.

It is felt that the advantages to be gained from the use of control of this type are such as to justify not only further experimenting with its application to the control of battery charging on Diesel locomotives, but also the commercial development of control of this type.

Standard Symbols

A considerable part of the report pages are devoted to electrical symbols for schematic wiring diagrams. They are offered as information, pending discussion with the American Standards Association. If acceptable to A.S.A., this part of the report will be ready for adoption as recommended practice in the manual.

Wire and Cable for Diesel Locomotives

Members of the Committee on Automotive and Electric Rolling Stock were sent a questionnaire intended to bring out service experience with various types of wire and cable insulation on Diesel-electric locomotives, and also opinions and recommendations in this regard. Replies were received from three manufacturers and six railroads, the latter basing reports on over 400 Diesel-electric and about 300 electric locomotives.

To summarize the reports very briefly, varnished cambric seemed to show the longest life, 11 to 17 years on Diesels and 15 to 20 years on electrics. It received little adverse criticism and was to a considerable extent recommended, although limitations are recognized.

Thirty per cent rubber covered cable equalled the 20 years in electric service, but was not reported on Diesels. Code rubber, Buna-S, and Neoprene were mentioned with relatively little favorable comment.

Synthetics of the Flamenol type received practically no adverse comment. Since very little has been in service for more than two or three years, opinions regarding it are hopeful but reserved.

Standard Lamps for Diesel-Electric Locomotives

The Committee on Automotive and Electric Rolling Stock was given an assignment in 1945 to study and recommend a list of lamps for use on Diesel-electric locomotives. The study revealed that there was a distinct lack of uniformity in lamps on these locomotives, resulting in considerable expense to builders and users. The committee's recommendations led to the list shown on pages ES-G-34-1946 of the manual.

At the time this list was submitted it was recognized that due to the rapid development in the Diesel locomotive field, certain changes and additions might become necessary. Therefore a sub-committee was appointed to reconsider the present list and make suggestions for additional lamps.

The committee recommends that the list shown in the table be substituted for the list shown on page ES-G-34-1946 in the manual in its entirety; and offers its comments below on the individual lamps considered.

Standard Lamps for Diesel-Electric Lomocotive Service

Volts	Watts	Bulb	Base	Filament	Manufacturers description
6-8	0.25A	T-3-¼ Clear	Min. Bay	C- 2	No. 44
24-28	4	RP-12	D.C. Index	......	"Black Light" (see note 1)
34	15	S-14 I.F.	Med.	C- 9	Locomotive cab
34	50	A-19 I.F.	Med.	C- 9	Rough service
60	25	A-17 I.F.	Med.	C- 9	Rough service
60	50	A-19 I.F.	Med.	C- 9	Rough service
64	30	S-11 Clear	D.C. Bay	C- 7A	Train marker
75	15	S-11 Clear	D.C. Bay	C- 1	Diesel indicator
75	25	A-17 I.F.	Med.	C- 9	Rough service
75	50	A-19 I.F.	Med.	C- 9	Rough service
120-125	50	A-19 I.F.	Med.	C-22	Rough service
12	360	G-25 Clear	Mog. Pf.	CC- 8	Loco. headlight
12	480	G-30 Clear	Med. Bi.	CC- 6	Loco. headlight (wigwag warning)
30	200	PAR-56 Clear	Screw Term.	C-13	Loco. headlight (internal reflector)
32	100	A-21 Clear	Med.	C- 5	Loco. headlight
32	250	P-25 Clear	Med.	C- 5A	Loco. headlight
32	250	P-25 Clear	Med. Pf.	C- 5A	Loco. headlight
60	100	A-21 Clear	Med.	C- 5	Loco. headlight
60	300	P-25 Clear	Med. Pf.	C- 5	Loco. headlight

Note 1: With suitable resistance ballast and starting circuit from 24 to 125-volt supply.

The report is signed by W. S. H. Hamilton *(chairman)*, equipment electrical engineer, New York Central; L. S. Billau, electrical engineer, Baltimore & Ohio; R. I. Fort, assistant research engineer, Illinois Central; E. J. Feasey, chief inspector of Diesel equipment, Canadian National; H. F. Mackay, supervisor of Diesel engines, Atchison, Topeka & Santa Fe; H. C. Taylor, Diesel superintendent, Southern; Marion Sharpe, superintendent automotive equipment, Chicago, Rock Island & Pacific; J. Stair, Jr., electrical engineer, Pennsylvania; H. C. Paige, assistant mechanical engineer, New York, New Haven & Hartford; H. D. Parker, general supervisor of Diesels, Atlantic Coast Line; R. W. Murray, general supervisor of Diesels, Seaboard Air Line; and P. H. Verd, superintendent motive power and equipment, Elgin, Joliet & Eastern.

Discussion

L. E. Grant (C.M.St.P.&P.) said that the Milwaukee Road has some 150 Diesel-electric locomotives using 7 or 8 different lubricating oils, and it is not simple to have the right oil because the various brands are not miscible due to the different additives. Car departments should also be interested in this problem as Diesel engines are used as a source of power on

passenger cars and on head-end cars. In the movement of a passenger car that is so equipped from coast to coast over several railroads, these engines eventually will either require a tag to show the type of oil in the car or the oil will have to be changed when the level is low. Railroad policy has been weak with regard to additive oils. The additives are generally made by chemical companies, rather than by the petroleum companies, and are sold to the petroleum companies for blending with their oil. The speaker thought the A.A.R. should ask the oil companies to sell oil with additives that are miscible, and that this should not be a handicap as there are only two or three different additives manufactured.

No Satisfactory Load-Indicating Device

L. S. Billau (B. & O.) said that it is impossible to find a satisfactory load-indicating device for Diesel-electric locomotives. The B. & O. considered this problem for two or three years at Baltimore with regard to steam trains being hauled through that city by 30-year-old electric locomotives designed to haul for trains of the weight normally run when they were built. As train loads have doubled since that time, certain check points of the type mentioned in the report were set up. This solution has shown promise and is also used now on Diesel power.

R. I. Fort, (I.C.), said that with regard to symbol 12-1 for a thermal-trip air circuit breaker, there was need for an additional symbol for a non-thermal trip air circuit breaker. This should be added to the list and designated as symbol 12-2. It could consist of two half circles plus one full cycle of a zigzag line similar to symbol 32.

Because of a favorable letter received from the American Standards Association, a recommendation that the symbols drawn up by the committee be referred to letter ballot was adopted so that the committee could proceed with their work without delay which would be entailed in waiting for another annual meeting.

H. C. Paige, (N. Y., N. H. & H.), recommended that the list of lamps be referred to letter ballot, and this recommendation was adopted.

R. I. Fort, (I.C.), asked if a standard for the telephone communication receptacle should be set up now as few railroads are using them. Mr. Andrucetti said that if the trend is toward such installations now is the time to set up the standard.

W. S. Weff (F.E.C.), said that while many Eastern roads are going toward telephone communications, some roads are holding out as they don't know where to put the receptacles and that the time for setting up a desired standard location is now.

L. S. Billau (B. & O.), said that the B. & O. is one of the few roads that has the problem of extending communication to the Diesel-electric locomotives, and that there should be a standardized connection between the locomotive and the head-end car.

(The report was accepted.)

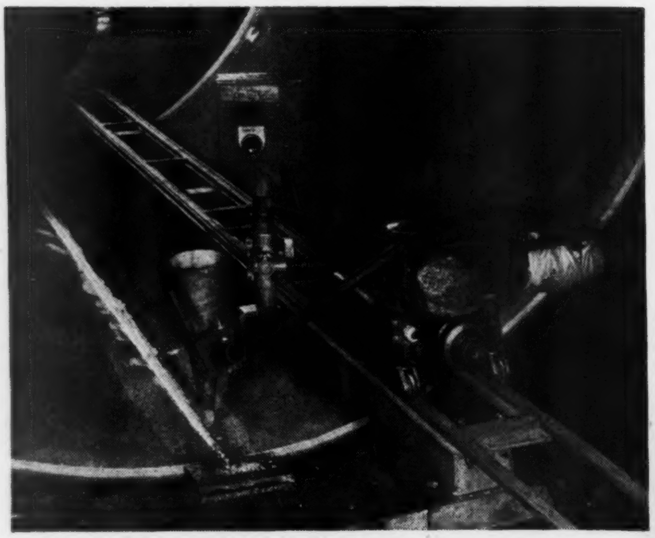
Welding and Cutting

The committee's first assignment was a continuation of tests of welder's lamps. Three of the lamps were used in a coach shop and the other three in a boiler shop. The lamps used in the coach shop had an average life of 70 hours; those used in the boiler shop averaged 92 hours. One of the latter lamps had burned 102 hours when it was accidentally broken by being dropped.

All six lamps had some weld spatter on them, much more than an ordinary lamp would stand without breaking, and one lamp had a heavy accumulation of weld spatter. With the exception of the single lamp broken by being dropped, all other lamps failed by the filament breaking or becoming detached from its support.

The lamps have, in all cases, been reported as being very satisfactory so far as illumination of the work is concerned.

In view of the results, it is the opinion of the committee that these lamps are not economically justifiable in their present state of development. The committee further believes that a real need exists for a special welder's lamp that would be resistant to weld spatter and that a sufficiently large potential market exists to make the development of a successful lamp worth while.



Automatic welding head attached to a radiograph machine

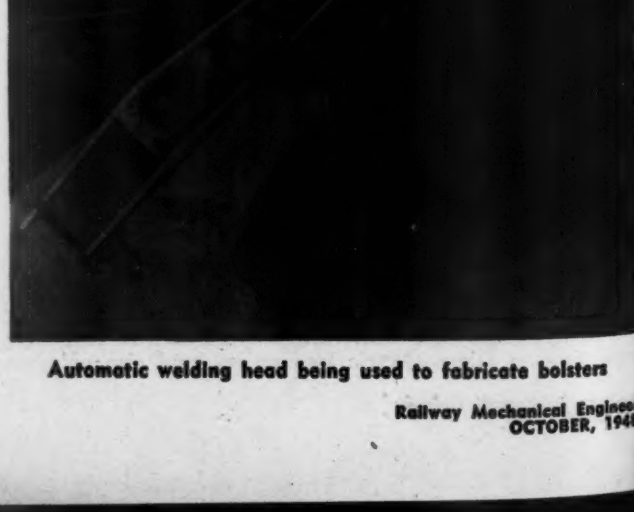
Flame Cutting by Powdered Flux Injection

Part two of the report describes flame cutting by the powdered flux injection process. This description is summarized in the following:

Stainless steels, both straight and chrome nickel types, resisted the flame cutting torch for many years. During the past two years, however, the development of flux injection cutting, a simple, economical and effective method, has overcome the difficulty. Now where flux-injection is in use, stainless steel is being cut to desired shape by flame cutting, with costs and quality comparable to flame cutting of mild steel.

The fundamental difficulty in flame cutting stainless steels by the conventional process is a layer of refractory oxides, principally of chromium. These oxides have such a high melting point that they do not liquify and flow off as a slag in the way oxides from commercial mild steel do. In flux-injection cutting, a chemical flux is used to produce fluid slags of these oxides which otherwise prevent the cutting action.

The flux is a finely pulverized non-metallic material of reasonable cost. The means of applying it is simple and efficient, requiring only one compact piece of special equipment —a flux feeder unit.



Automatic welding head being used to fabricate bolsters

The key operating element of the flux feeder unit is a pressurized vibratory hopper, which is coupled into the cutting oxygen line.

Depending on the requirements of the job, the unit feeds flux to the cutting oxygen line at a selected rate. The flux is then carried directly by the cutting oxygen itself and emerges from the cutting orifice in the cutting tip, so that cutting and fluxing action are both obtained in the kerf at the same time.

As fast as the oxides from cutting form, they mix with the flux and flow off so that a fresh surface of metal is continuously exposed to the cutting oxygen. Except for the flux feeder unit, the equipment for the flux-injection machine is little different from that used for cutting commercial steel plates.

Although the flux-injection process of flame cutting was originally developed for cutting stainless steel, it is now also

Head for manual submerged-arc welding

used for cutting stacked commercial steel plates. Flame cutting stacked steel plates without the use of flux-injection, requires extremely close contact between the plates in the stack. When flux-injection cutting is used, such contact is much less important and a substantial reduction in set-up and removal time is therefore made possible.

Manufacturing of Oxygen

The question of the feasibility of manufacturing oxygen in railroad plans is discussed by the committee in response to its assignment 2-C. Equipment for this purpose is available and the report indicates the extent of the railroads' requirements and shows a floor plan for a 100-meter oxygen plant.

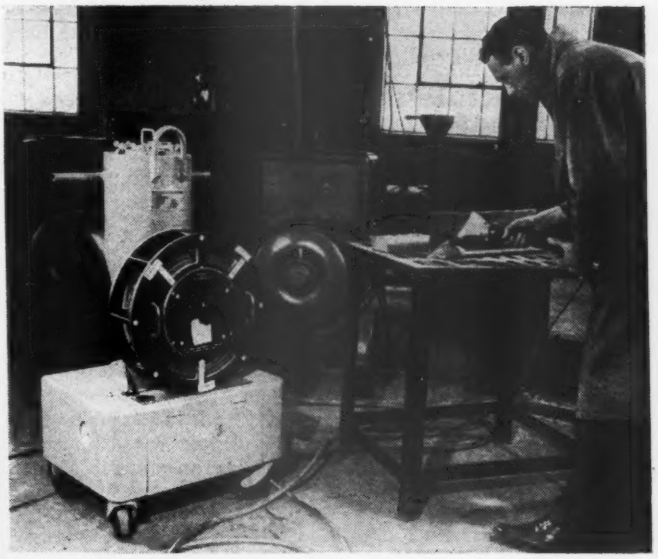
In conclusion the report states that the desirability of railroads acquiring and operating oxygen plants with which to manufacture oxygen for use in one plant and distribution in cylinders to other points, is something which requires a great deal of study by any railroad contemplating an installation of this kind. At the present time it is not known that any railroad has such a plant, so no specific information is available as to the expected costs, details of operation, etc., but it appears within reason that such a plant might fill a real need in some cases where a combination of factors lead to unusually high costs for oxygen in cylinders or supply problems are difficult.

Semi-Automatic Welding Equipment

A major part of the report—of particular interest to electrical men, deals with the advantages of welding with the hidden arc deep flux process, employing high current densities. One new development has greatly increased the versatility of the process that produces the smooth, deeply penetrating, spatter-free welds normally associated only with fully automatic operations.

The basic element of the unit is a standard 600-amp. welder which can be used for straight manual welding, as well as semi-automatic welding. Mounted on the welder is a compact unit containing the wire reel, feed mechanism, drive motor and voltage controls. A special cable to which is attached a cone-shaped welding gun completes the equipment.

The aluminum cone-shaped welding gun holds 3½ lb. of granular flux, which is dispensed by gravity through a special heat-treated nozzle, in sufficient amount to cover the arc as the weld is made. The nozzle, which is insulated from the rest of



Equipment for manual submerged-arc welding

the gun, also introduces the welding current to the wire and straightens the wire as it is fed through. The gun is attached by a conveniently detachable coupling to a special cable that runs to the feed mechanism unit. The cable is rubber-covered stranded copper, in the center of which is a closely wound coil spring. This cable provides a compact flexible carrier for both the wire and the current. The equipment will operate with a maximum of 25 ft. of cable.

With this equipment, an electrode wire 5/64-in. diameter is fed automatically to the work through the flux that is deposited from the gun. A constant arc voltage is maintained by automatic controls independently of the height of the gun above the work. The height of the gun determines only the amount of flux that will be deposited over the arc. The arc is started by simply touching the electrode to the work through the flux, which automatically starts the wire feeding at the proper rate for the current being used. When needed for tack welding or finishing short welds, it is possible to switch over to manual welding with the machine, without any additional adjustments.

The current densities used are extremely high. Electrode wire is fed through the nozzle of the welding gun at the rate of approximately 300 in. per min. Because current is introduced to the wire close to the arc, it is possible to use 600 amp. with a 5/64-in. diameter wire. For ordinary manual arc welding, an electrode four times as large, or 5/16-in. in diameter is required to handle 600 amp. The current densities are the highest ever used and effectively concentrate heat sufficiently to weld ½-in. plate in a plain butt joint, one pass on each side, without edge preparation.

This simplicity of the hidden arc process makes it useful in applications where the weld is inaccessible for automatic welding, or where the size and contour of the weld have made automatic welding impractical. The equipment makes it possible to take advantage of the cost reductions obtained by high welding speeds, without a large investment in fully automatic equipment. The equipment can readily be moved and operated wherever it is desired to set up the welding operations. No extra jigging is needed.

Welds made with the high current densities used in the process are made at high speeds, which results in deeper penetration and smaller cross section of the weld. The amount of deposited metal is reduced and warpage minimized. The operation is free of smoke, visible arc and spatter, thus making for more comfortable working conditions and higher operating factor. The appearance of the weld is clean and smooth.

This equipment has been used successfully in the production of containers, pressure vessels, railroad equipment, machinery parts, pipe, construction equipment and in many other applications. Preparation of plate to be welded is about the same as where fully automatic welding is to be used.

The report also describes another welder of the same type for semi-automatic welding, which may be used with currents

up to 900 amp. and which employs a tank holding 75 lb. of granular material for submerging the arc. Its reel for welding rod holds a 25-lb. coil.

Effect of Primary Paints on Welds

In the fabrication of weldments it is often desirable to apply protective paint to the surfaces of component parts that are not accessible for painting after completion of welding, thus necessitating welding on surfaces having a coating of protective paint.

The section of the report dealing with this subject states that where top quality welding is required, the use of primary paints should be avoided or limited to films not in excess of 1.5 mils thick. The best paints to use in the order of their merit are given as (1) a zinc paint with a chromate base, (2) a mixed pigment paint containing not more than 70 per cent (by weight) red lead, and (3) a red lead paint containing not more than 75 per cent (by weight) red lead. It concludes with the admonition that an approved respirator for lead fumes should be worn by welders when welding on material coated with paint containing red lead.

Silver Solder Processes

Section 5 of the report includes a general discussion of the subject of silver solder brazing alloys. It includes a list of a number of silver brazing alloys now available and gives characteristics of each.

Flash Welding

Section 6 of the report describes flash welding, particularly as it is used by railroads for the safe-ending of locomotive flues and for making brake rods. It states that the chief advantage of the flash weld process over the pressure resistance process is that dissimilar metals, varying in individual fusing temperatures, may be welded because flashing may be carried on until each metal has reached its own individual fusing temperature.

Restoration of Worn Parts

The committee feels that some of the existing welding rules which cover the restoration of worn parts are unclear or inconsistent and should be revised. Concerning solid axles the present rule reads as follows: "Building up worn end collars permitted (electric welding preferred) to a finished thickness of at least 3/8 in., but not exceeding dimension new. Welding cracks or fractures, welding on an entire collar, or building up surfaces other than end collars is prohibited."

The committee feels that the 3/8 in. can be misinterpreted. It is not clear whether the rule means that at least 3/8 in. of weld metal should be left after machining, or 3/8 in. or collar thickness should be left. The committee suggests the rule be reworded to eliminate any uncertainty.

Rules covering cast steel bolsters and shank wear of couplers limit the amount of worn material which may be restored by welding, but permit the welding of completely broken parts. This the committee feels is inconsistent.

Similarly, in the case of brake levers, the amount which holes may be built up is limited, while present repair practice is to completely fill a worn hole and redrill.

Suggestions are also made for improving and clarifying the rules governing the repair of cast steel coupler yokes.

Revision of Manual

The last 12 pages of the report cover proposed rearrangements of material in section F of the manual, dealing with welding and flame cutting. The reasons given for such changes are that the material on welding and flame cutting in section F of the manual is the work of various committees over the past 10 years. As is inevitable in material written in this bit-by-bit manner, section F as it now stands, suffers from unsystematic arrangement, with too much emphasis on some subjects of secondary importance to railroads and not enough information about some of the more important topics.

The report is signed by L. E. Grant *(chairman)*, engineer of tests, Chicago, Milwaukee, St. Paul & Pacific; A. F. Stiglmeier, general supervisor, boilers and welding, New York Central; Frank Hayes, general foreman, blacksmith shop, Illinois Central; M. A. Herzog, chief chemist, St. Louis-San Francisco; J. S. Miller, metallurgical engineer, New York, New Haven & Hartford; Frank A. Longo, general boiler inspector, Southern Pacific; B. G. Wollard, welding instructor, Chicago & North Western; Robert Moran, welding supervisor, Missouri Pacific; John Hengstler, supervisor of welding, Altoona Works, Pennsylvania; and H. A. Patterson, supervisor of welding equipment, Atchison, Topeka & Santa Fe.

Discussion

One member remarked that two spatterproof lamps which had been in service on his road for 460 hr. were well-spattered but still burning.

L. E. Grant (C.M.St.P.&P.) said that one manufacturer claimed that spatterproof lamps were not practical as the gas volume was too small for the wattage.

W. S. Hamilton (N.Y.C.) said that the next step to be done in this investigation would be to put the development of spatterproof lamps up to the major lamp manufacturers. H. G. Bass (N.Y.C.) asked what is the life of the spatterproof lamp in constant service where the light is close to the arc. The answer was that this is unknown although in some cases the lamp is well covered in as little as 50 hr.

R. Moran (M.P.) asked how passengers would be extricated from inside stainless steel cars involved in a wreck as these cars cannot be cut to remove the injured. He thought it alarming that the manufacturers have done nothing, and that the railroads don't know what to do.

H. G. Bass (N.Y.C.) asked what advantage there was to stack cutting and in reply was told that the clamps cut labor costs and that for heavy cutting less oxygen pressure is required than with commercial methods.

Mr. Bass inquired why, with only 60 per cent of the material left on a bolster, one may still weld a crack of any length, but is not permitted to weld new material on the bolster.

It was also asked, with regard to welding limitations, just what is limited? For example, when welding is eliminated on certain castings, such as bolsters and side frames, it may be for economic but not for physical reasons.

K. F. Nystrom (C.M.St.P.&P.) said that the Milwaukee Road does more welding than all the builders combined, and that its cars are now 100 per cent welded except for safety appliances. The Milwaukee Road does not scrap steel castings; all are arc welded even when broken in several pieces. The day is coming, he said, when 100 per cent welded cars will be built.

Mr. Bass said that the word limitations should not apply to the work but to the man. Welds that fail, he said, are usually less than 50 per cent welds. He has seen no 100 per cent welds fail. This effect of the human element, he added, is probably the reason for the I.C.C. restrictions on welding.

The Welding of Steel Castings

Dr. Lailliequeist (American Steel Foundries) mentioned some of the factors that influence the welding of steel castings, including the chemistry of the casting, especially the carbon content, and the alloy contents, such as nickel, chromium, molybdenum, etc. As to the proper welding procedure and testing, and the type of electrode, recent investigations show that a light coated rod should be used even though it costs two or three times as much as other rods. An electrode must be found to match the properties of high-tensile steel castings with a tensile strength of 60,000 lb. per sq. in., a yield strength of 90,000 lb. per sq. in., 22 per cent elongation and a 45 per cent reduction in area. The question of whether the temperature may be 40, 70 or 300 deg. F. depends on the thickness of the section. With 1/2- and 3/4-in. sections, preheating has little effect on the hardness, but for 2-in. sections and above, this is affected substantially by the preheat. In comparing one-, three- and five-pass welds, the one-pass welds were the least satisfactory. He also called for a definition of major and minor welds.

It was remarked with regard to prohibiting the welding of safety appliances, that a welded drawbar pulls thousands of tons but a grab iron must be riveted. There are 48 different welding processes applied to railroads in 30 different manners. As to high-tensile steel castings, these are welded in other industries where service is as rugged as on the railroads.

It was recommended that sections 2A, 3, 4 and 5 be accepted; that sections 1 and 7 be continued; that section 2B

be withdrawn; that sections 2C and 6 be accepted as information only; that section 8 be referred to the proper committee; and that section 9 be given tentative approval. The recommendations were adopted.

Locomotive Electrical Equipment

Sealed Beam Headlights

On the subject of sealed beam locomotive headlights the report states that the 1947 report described and illustrated this subject in considerable detail.

Subsequently one railroad contemplated the application to 27 steam passenger locomotives.

Certain refinements in design have been made to simplify the mounting of two sealed-beam, 200-watt, 30-volt lamps in the existing headlight case. This was accomplished by means of a special headlight door casting, with the sealed-beam lamps mounted directly therein, without separate cover lens. An auxiliary 15-watt, 34-volt lamp, permanently connected, is also mounted in this casting.

The additional locomotives, when equipped, will offer means to obtain comparable lamp life data and broaden the scope of operating experience.

Power Sources for Electro-Pneumatic Brakes

The 1947 report described means for equipping steam locomotives with means for supplying electro-pneumatic brake circuits with 64-volt, d.c. power. The 1948 report recommends that, in view of the few steam locomotives involved at this time, no standards be submitted for inclusion in the manual, and that both above-mentioned assignments be removed from the list and held in abeyance until greater need for standards develops.

A.C. Power for Locomotives

One railroad has underway an experimental application of an a.c. turbo-generator of the permanent magnet field type, to supply power for radio, headlights and train control. It is expected that service data on this application will be aavilable for subsequent submission to the Section.

It is the understanding of the committee that an air-cooled rectifier and conversion device will be used with the a.c. turbo-alternator to supply d.c. power for certain locomotive electrical loads.

The 1947 report described in considerable detail oil-cooled, and sealed conversion devices for electro-pneumatic brake, and for cab signal electrical loads. These devices are described as being large, heavy and quite costly.

Preliminary studies made by one manufacturer on air-cooled conversion devices show the following data:

Service	*Volts*	*Amps.*	*Weight*	*Height*	*Width*	*Depth*	*Cost*
E-P Brake	75	7.5	54 lb.	14 in.	16 in.	12 in.	?
Cab Signal	32	4.0	23 lb.	13 in.	9 in.	8 in.	?

No electrical filters are included in above sizes.

Components are protected by paint, but it is thought possible to devise hermetic sealing of the rectifier elements.

The report is signed by A. D. Whamond *(chairman)*, foreman, office of electrical engineer, Pennsylvania; Roy Liston, mechanical inspector, Atchison, Topeka & Santa Fe; C. W. Nelson, electrical engineer, Chesapeake & Ohio; W. G. Switzer, assistant engineer, New York Central; R. G. Thompson, assistant chief mechanical inspector, New York, New Haven & Hartford; and A. C. Zagotta, supervisor cab signals and locomotive electrical equipment, Chicago, Rock Island & Pacific.

Discussion

W. C. Chapman (C. & N. W.) said the North Western has one locomotive equipped with a Mar's sealed-beam head lamp. While its life, he said, has been satisfactory, on test it did not meet I.C.C. requirements for pickup.

M. A. Pinney (P.R.R.) said that the Pennsylvania has several locomotives equipped with sealed-beam lights as emergency, not normal, headlights. This installation comprises a single sealed-beam lamp and the test department found that it meets I.C.C. pickup requirements.

It was reported that the New York Central has an a.c. generator with a rectifier for 32-volt train control equipment which will be in operation in about a month.

The subjects of this report this year are for information only and the report was accepted as information.

Motors and Control

The major part of the report of the joint committee (Electrical Section, Mechanical Division and Electrical Section, Engineering Division) consists of a layout for an electrical shop for repairing motors, generators and other electrical equipment, used on Diesel-electric locomotives. This section of the report will appear in the November issue of *Railway Mechanical Engineer*.

Power Factor Correction

The committee has worked out the set of curves shown on the accompanying chart provides an easy graphic method of determining the amount of capacitance required to correct to unity, or to any intermediate lagging power factor, any given load or any given power factor.

The existing kw. load and its corresponding kva. value are determined by test; using, for instance, a recording watthour meter and a recording ammeter and voltmeter, or proper type autotransformer with a watthour meter and a volt ampere meter. Simultaneous readings are taken and averaged, from which the average power factor is calculated by dividing the kilowatts by the kilovolt-amperes.

In using the curves, it is necessary to first locate the vertical line corresponding to the kilowatt load and note where it intercepts the power factor curve. The vertical distance between that point and the horizontal co-ordinate represents the kva. of capacitance needed to correct to unity power factor. Similar distances along that vertical line

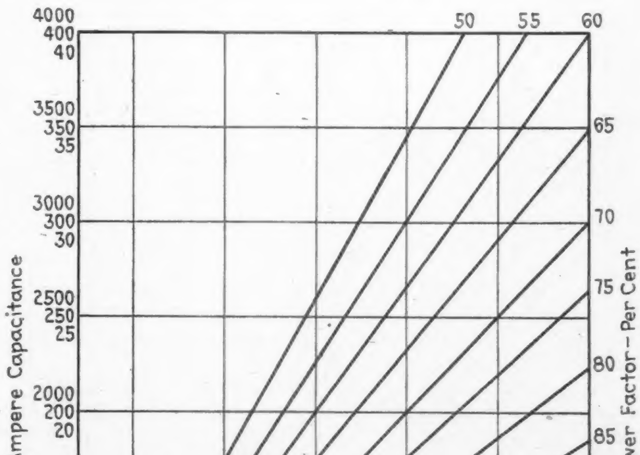


Chart for determining amount of capacitance required to bring power factor to any desired value

give amounts of capacitance required to correct for any intermediate power factor.

Motors and Control for Hazardous Locations

In response to its assignment on motors and control for hazardous locations, the committee has listed the services for which various types of motors are designed and has offered information on practices of certain railroads, particularly concerning the use of motors in fuel oil and lubricating oil pump rooms.

Rectifiers for Battery Charging

Concerning copper-oxide and selenium rectifiers for battery charging, the report states that the two are about equally efficient, that the copper-oxide have an overload capacity, that the selenium rectifiers have an advantage in size and weight, that the voltage rating of the copper-oxide rectifier is 6 to 8 volts per cell, while the selenium rating is 18 to 26 volts, and that the copper-oxide stacks cost 50 per cent more than the selenium stacks. It concludes that copper-oxide rectifiers should be used where a large amount of current and low voltage are required, and that selenium rectifiers should be used for relatively high voltages and low currents.

The report is signed by the joint committee on Motors and Control whose members are R. H. Herman, *chairman*, Joint Committee, and *chairman*, Electrical Section, Mechanical Division, engineer shops and equipment, Southern; A. B. Miller, electrical inspector, Chicago & North Western; G. O. Moores, assistant engineer (construction and maintenance), Baltimore & Ohio; C. F. Steinbrink, electrical foreman, Chicago, Rock Island & Pacific; A. P. Dunn, *chairman*, Electrical Section, Engineering Division, electrical foreman, New York Central; J. O. Fraker, general electrical and shop engineer, Texas & Pacific; P. W. Pleasant, supervisor and chief fire inspector, Chicago, Indianapolis & Louisville; and H. E. Preston, power supervisor, Illinois Central.

Discussion

The report was presented by C. F. Steinbrink, electrical foreman, Chicago, Rock Island & Pacific. A study of the railroad electrical repair shop indicates that the railroads are not alert to what can be done by production methods common to industry. To impress management with this fact, it is necessary to keep very accurate cost data. In one instance, he was informed that a certain railroad shop was rewinding traction motors for a total cost of $720. Subsequent investigation developed the fact that the coils alone cost $850.

An assembly line process is necessary to reduce the cost of maintenance in a railroad electric repair shop for Diesel locomotive motors and generators. Circumstances, he said, do not permit railroads to compete with prices paid for skilled workman outside. It is, therefore, necessary to set up a shop which can be operated by men available to the railroads.

R. C. Sorenson (N.P.) said that objections had been raised to portable electric welders, even though properly grounded, where supplied with 3-phase 440-volt current. He wondered whether anyone else had received similar objections and whether 440-volt circuits were appreciably more hazardous than 220. Other members replied that both 440 and 220 volts should be grounded with a 4-conductor cable and that, because either 440 or 220 volts will kill if conditions are right, there is not much more hazard to yard workers with 440-volt portable circuits.

H. C. Paige (N.H.) asked whether motor manufacturers agreed that the use of the vapor degreaser was satisfactory. It was stated that all varnish companies now produced varnishes that are guaranteed not to be affected by the degreaser. It was also mentioned that on the Rock Island one traction motor ran for 11 years and 4,000,000 miles before rewinding, and therefore the mileage was probably increased rather than decreased by the use of the degreaser.

Sections 3, 5 and 6 were accepted as information; the report on power factor correction, section 4, was adopted for inclusion in the manual; and revision of the manual with regard to new developments in motor and control equipment, was continued to next year.

Car Electrical Equipment

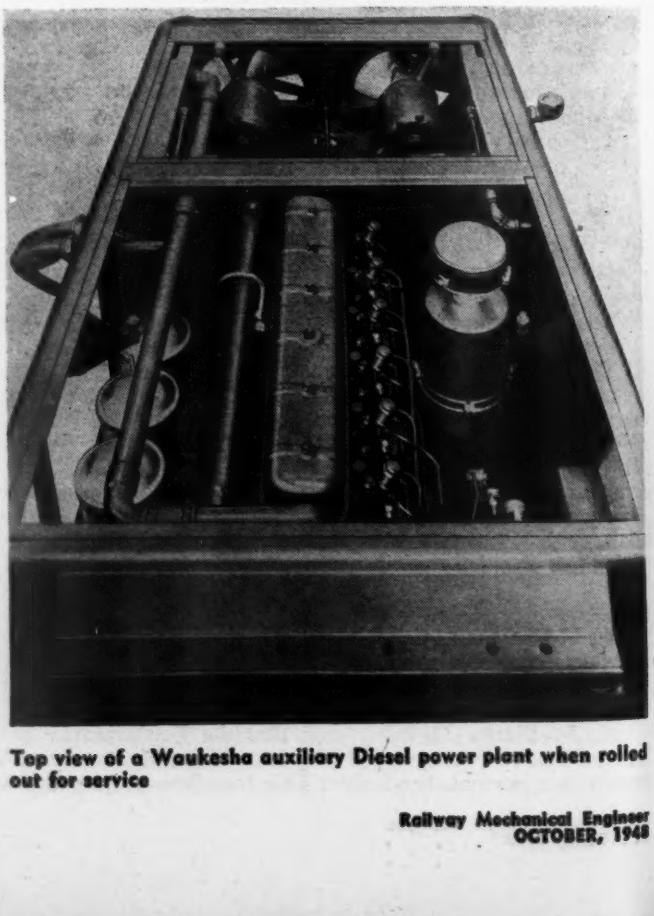
Power Supply for Diners

In preparing an assignment on power supply including requirements for cooking on diners, it was decided by the committee to develop as nearly as possible the estimated maximum load requirements for a regular dining car with full size kitchen and pantry. The load to include electric cooking, electric refrigeration, air conditioning, ventilation, lighting and utility electrical appliances, which in the opinion of the committee are essential to good operation. It is assumed each individual railroad will necessarily operate under conditions which will alter the load requirements, such as temperature, type of lighting and the number of units of cooking equipment and utility appliances required to suit their particular operating conditions.

In the opinion of the committee the following maximum loads will meet the requirements of the majority of railroads, although it does not agree with the load report issued in the 1939 proceedings:

Equipment	Maximum Load
Air conditioning—cooling	10 kw.
Ventilation	2 kw.
Lighting	4 kw.
Refrigeration	4 kw.
(a) Refrigerator—steward's section—10 cu. ft.	
(b) Refrigerator—pantry and kitchen—50 cu. ft.	
(c) Dresser-pantry—6-8 cu. ft.	
(d) Ice cream cabinet—pantry—3 cu. ft.	
(e) Water cooler—pantry—10 gal. per hr.	
(f) Frozen food storage—kitchen—10 cu. ft.	
(g) Fish storage kitchen—3 cu. ft.	
Ice cube maker (mixed drinks only)	1 kw.
Electric ranges—three at 8 kw. each with two hot plates and one oven per range*	24 kw.
*Proposed range, 2 at 10 kw. each, with three hot plates and one oven per range.	
Fry kettle	5 kw.
Electric broiler	5 kw.
Coffee urn	4 kw.
Steam table	2 kw.
Utility appliances	6 kw.
(a) Glass washer—pantry	
(b) Juice extractor—pantry	
(c) Silver sterilizer—pantry	
(d) Cup warmer—kitchen	
(e) Plate warmer—kitchen	
(f) Dish washer—kitchen	
(g) Four piece toaster	
Total	67 kw.

The above loads do not include hot water at approximately 20 kw., nor car heating at approximately 45 kw., which can



Top view of a Waukesha auxiliary Diesel power plant when rolled out for service

be obtained from a combination of electric heat and reclaimed waste heat if Diesel alternators are used.

In the procurement of data for the above report, the committee obtained from the Edison General Electric Appliance Company an estimated load cycle for a 36-seat diner. The table below should be of interest to all railroads contemplating electric cooking. This load cycle is based on slightly different maximum loads than shown in the maximum load table.

Estimated Load Cycle for 36-Seat Diner
Maximum Temperature Day

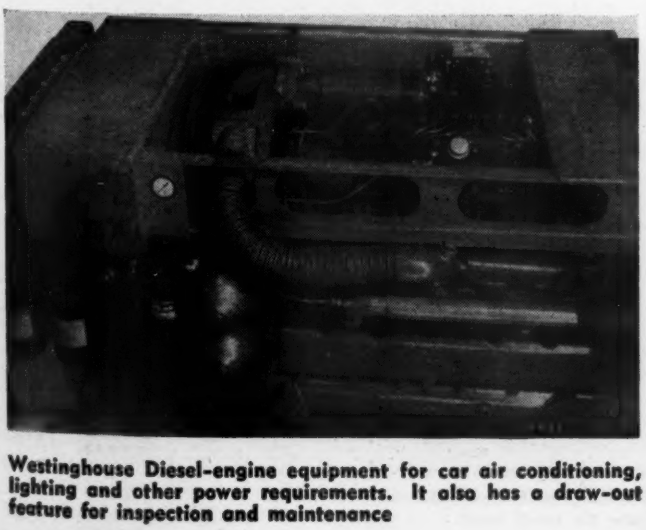
Time A.M. From	To	Cooking	Refrig., Ventilation, Air Cond. and Lighting	Total Kw.
4:30	5	14.0	15	29.0
5	5:30	11.2	14.8	26.0
5:30	6	17.7	12.3	30.0
6	6:30	18.0	11.5	29.5
6:30	7	19.8	11.7	31.5
7	7:30	18.6	11.2	29.8
7:30	8	17.6	9.4	27.0
8	8:30	18.6	9.4	28.0
8:30	9	12	9.4	21.4
9	9:30	14	8.6	22.6
9:30	10	12.4	8.6	21.0
10	10:30	18.8	5.6	24.3
10:30	11	16.9	6.0	22.9
11	11:30	18.3	9.5	27.8
11:30	12	21.6	9.9	31.5
12	12:30 p.m.	21.7	13.4	35.1
12:30	1 p.m.	23.4	13.2	35.6
Time P.M.				
1	1:30	23.2	12.9	36.1*
1:30	2	20.5	10.9	31.4
2	2:30	16.6	9.5	26.1
2:30	3	7	9.5	16.5
3	3:30	15.0	9.9	24.9
3:30	4	16.9	9.7	26.6
4	4:30	17.9	9.6	27.5
4:30	5	17.3	9.8	27.1
5	5:30	23.2	12.0	35.2
5:30	6	23.4*	12.6	36.0
6	6:30	23.2	12.5	35.7
6:30	7	22.2	12.5	34.7
7	7:30	21.2	11.4	32.6
7:30	8	20.5	11.0	31.5
8	8:30	20.2	11.0	31.2
8:30	9	15.1	10.9	26.0
9	9:30	12.6	8.5	21.1
9:30	10	7.2	8.3	15.5
10	10:30	7.7	9.3	17.0
10:30	11	6.3	9.3	15.6

*Maximum demand.

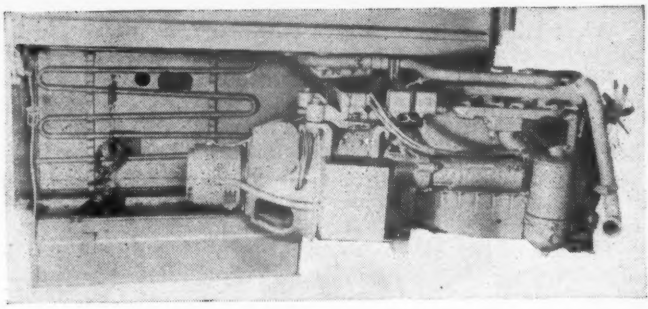
Load Cycle—Based on Following
Estimated Maximum Loads

Refrigeration	3	kw.
Ventilation	2	kw.
Air conditioning	7.5	kw.
Lighting	2.5	kw.
Two ranges	16.0	kw.
One fry kettle	4.5	kw.
One backshelf broiler	5.25	kw.
One coffee urn	4	kw.
One hot food table	2.15	kw.
One auxiliary water heater	3	kw.
Total	49.90	kw.

When sufficient operating data can be obtained from various railroads, that either now have or contemplate electric cooking, the committee will prepare load tables covering actual installations under operating conditions.



Westinghouse Diesel-engine equipment for car air conditioning, lighting and other power requirements. It also has a draw-out feature for inspection and maintenance



A General Electric-Buda Diesel-engine-generator swung out on its trunion for inspection

Fuses and Circuit Breakers

Heat generated by equipment in electrical lockers frequently produces locker temperatures which cause circuit breakers and fuses to open at current values well below their rating. At 114 deg. F., a temperature not uncommon in lockers, breakers will open at from 86.7 to 92 per cent of their rating and at 140 deg., they will open at 53.3 to 78 per cent of rating.

For panel board application, the standards of the National Electrical Manufacturers Association recommend that circuits and breakers be loaded not to exceed 70 per cent of the protective device rating. On this basis, the permissible load on the 15-to-50 amp. breaker at various temperatures would be as follows:

(Derate as indicated for various temperatures)

Rating—Actual Carrying Capacity in Amperes as Indicated Below

Amps.	77 deg.	114 deg.	122 deg.	140 deg.
15	10.5	9.1	7.7	5.6
20	14.0	12.6	11.9	10.5
25	17.5	16.1	15.4	14.0
35	24.5	22.4	21.0	18.9
50	35.0	32.2	30.1	27.3

When the smaller size breaker will not carry the load as indicated by the table above, it is necessary to use the next larger breaker. It is evident that care must be used in deciding what breaker to use when assembled in panel boards or located in lockers.

From the foregoing report, it is evident that lockers must be adequately ventilated to avoid considerable derating of the breakers. Such ventilation should preferably be by means of exhaust fans, exhaust ventilators or a combination of both, which will discharge to outdoors. It is good practice to locate the switch panel in a separate cabinet.

Some very pertinent information has been given to the Subcommittee pertaining to delayed action fuses having trade names such as: Fusetron and Trion. The blowing time of these fuses is also affected by the ambient temperatures.

Fuses are affected in a similar manner and the committee recommends that locker temperatures of both unventilated and ventilated construction should be determined since the excessive locker temperatures are the basic causes of overheated protective devices.

Standby Receptacles and Plugs

In its study of standby receptacles and plugs, the committee worked with the Committee on Car Air Conditioning Equipment to determine what sizes are necessary for genemotors having 25-hp., 3-phase, 220-volt, a.c. motors.

The investigation indicates that present standard receptacles and plugs rated at 60 amp. are adequate to handle the load imposed by the 25-hp. motors.

Fluorescent Lights

Concerning fluorescent lights, the report states that no new developments with fluorescent lamp auxiliaries have been made.

Lamp starters of the glow type and known as the "No blink" line, which prevents the lamp from blinking when lamps no longer function properly, are found to be an improvement over other types.

When slimline lamps are installed, the ballast should be located as close to the fixture as car construction will permit.

No new developments have been made with the cold cathode method of lighting.

A so-called "Warm Tone" fluorescent lamp (3000 deg.) hot cathode, has been developed for installations where incandescent lamps (2800 deg.) are also used. These lamps, if used without the incandescent type produce some objectionable results and they are under further development.

The use of the Circline lamp is reported with few exceptions to have not been extended beyond table and floor lamps.

Nickel-Cadmium Storage Batteries

On the subject of nickel-cadmium storage batteries, the committee offers the following information:

Two battery sets, each 88 cells, type RUG-36, 360-amp.-hr. capacity, called "Alcad," as manufactured by the Nickel Cadmium Battery Corporation, Easthampton, Mass., for service where 57-cell, 450 amp.-hr. lead battery was formerly used, operated from February 1947, to August 1947, on electro-mechanical air conditioned coaches equipped with 20/25-kw. axle generators. During this period, satisfactory performance was obtained.

Following this period, the manufacturer requested these sets returned to them for improvement; redesign of the wood trays and cans for additional insulation clearance.

Two sets, each 88 cells, type SLO-33-H, 360-amp.-hr. capacity were recently placed in service, replacing the type RUG-36 sets. These have not been in service sufficient time to establish any data for report.

It might be said, however, that, with this type of battery, the evaporation of water in the cells appears to be less rapid than with other types of batteries.

There is no information available on this type of battery for 32-volt and 64-volt service that will fit in standard A.A.R. battery box.

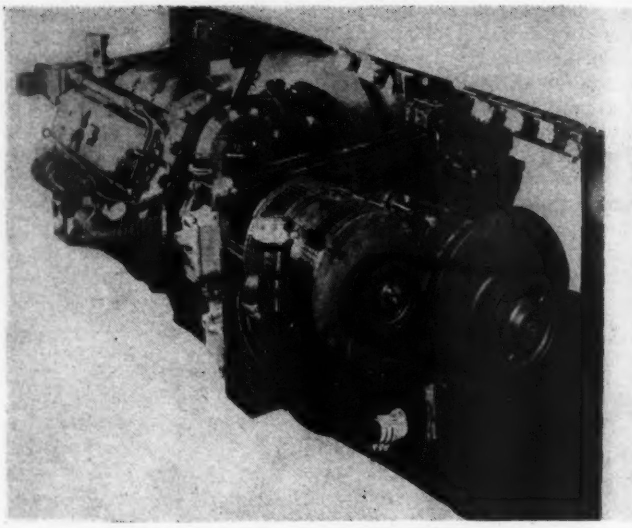
Call Bell Receptacles

Specifications for inter-call bell receptacles on passenger cars with the necessary drawings have been prepared and are included in the report.

Car Power Supply

A major part of the report is given over to the subject of individual power supply, including generator drives. On this subject, the report offers the following information:

There is nothing further to report this year on the application of Shepard or Excel drives. The one on the New York Central is going into its third year of operation and



A Frigidaire power plant withdrawn for servicing

the manufacturers report that they are trying to get into production on this drive and hope to then get a few additional installations.

The Spicer vertical drive is being developed. Engineering and design are progressing.

Due to the increased requirements for electrical power there has been very great interest shown in the development of under-car engine-driven equipment, particularly Diesel engine equipment.

A very considerable amount of research and development work have brought the small Diesel engine to a point where it can be considered as an economical unit for operation of under-car generator equipment. For best performance, these engines must operate continuously (and not intermittently as is now done with gas engine-driven equipment), which permits the use of a.c. generators, opening a field for lower maintenance cost on motor equipment because of the elimination of commutators and the possibility of using totally enclosed motors.

At this time, there are four companies now building such equipment. These power plants illustrated here are described in the report. Performance data on the Frigidaire unit is shown in the table.

It is found that the activity in application of radio communication to cabooses has very definitely slowed down. There are still efforts on the part of manufacturers of small

Table 1

Performance of Test Frigidaire Under-Car Diesel on Southern Pacific Coach 2725

(On run between Los Angeles and New Orleans-Southern Pacific Railroad)

Report of test (11/11/47-3/16/48)—4 months

Total mileage	75,839
Total hours Diesel operated	2,260
Total gallons Diesel fuel	3,298
Total lubricating oil (gal.)	34.62
Total cost Diesel fuel @ $.06706 gal.)	$221.16
Total cost of lubricating oil @ $.594 gal.)	$ 20.56
Total cost to service	$193.79
Total cost service and repair, Mtl.	$ 45.25
Fuel per 1,000 miles	43.5 gal.
Lubricating oil per 1,000 miles	0.458 gal.
Fuel per hour	1.46 gal.
Lubricating oil per hour	0.0153 gal.

Cost per 1,000 Miles

Fuel (@ $.06706 gal.)	$2.92
Lubricating oil (@ $.594 gal.)	0.27
Service labor	2.57
Service material	.60
Total	$6.36

There were three failures in this period.

Cost per Hour of Service

Fuel	$221.16
Lubricating oil	20.56
Service labor	193.79
Service material	45.25
Total	$480.76
Cost per hour of service	$ .224

Performance of Test Frigidaire Under-Car Diesel on Texas & Pacific Coach 1300 in General Service

Period of test (8/7/47-6/1/48)—10 months

Total mileage	72,835
Total Hours Diesel operated	3,712
Total gallons Diesel fuel	6,496
Total lubricating oil (gal.)	82.5
Total cost Diesel fuel (@ $.08302 gal.)	$539.29
Total cost lubricating oil (@ $.501 gal.)	$ 41.33
Total cost to service	$208.50
Total cost service & repr. Mtl.	$ 9.50
Fuel per 1000 miles	89.2 gal.*
Lubr. oil per 1000 miles	1.13 gal.*
Fuel per hour	1.75 gal.
Lubr. oil per hour	.0222 gal.

Cost per 1000 Miles

Fuel (@ $.08302 gal.)	$ 7.40
Lubr. oil (@ $.501 gal.)	.56
Service labor	2.86
Service material	.13
Total	$10.95

There were three failures in this period.

*Does not reflect true cost, as car has been used extensively as power car and as demonstrator.

Cost per hour of service

Fuel	$539.29
Lubricating oil	41.33
Service labor	208.50
Service material	9.50
Total	$798.62
Cost per hour of service	$ .215

The above tabulations should not be considered as being strictly comparable due to difference in runs and average car speeds. Any comparisons should be made on an hours of service basis as this eliminates the speed factor.

Diesel engines to have test installations made on caboose, although the axle drive still seems to be the most popular drive for caboose power.

The new activity is that of the recommended use of the Leece-Neville Company's a.c. generator, driven by an air motor, taking air from the train line on the caboose. An installation has been made recently and the amount of air taken is less than 20 cu. ft. a min., and is less than that required to make any brake application. The generator is an a.c. generator using a rectifier for charging batteries and furnishing d.c. power. Battery installation is a 6-volt job, and a generator operates in connection with a 6-volt battery to supply 10 amp. of d.c. power for caboose radios.

For information, the report of one railroad, which has operated 15 axle light cabooses for a period of eight months for a total of 1,095,000 miles, shows an average cost per thousand caboose miles for maintenance and service of power equipment of $3.56. This includes not only the direct labor and material used, but allows an equitable charge for storage battery depreciation reserve.

This report is signed by L. J. Verbarg *(chairman)*, electrical engineer, Missouri Pacific; S. B. Pennell, *(vice-chairman)*, assistant engineer, New York Central; L. C. Bowes, electrical engineer, Chicago, Rock Island & Pacific; J. E. Gardner, electrical engineer, Chicago, Burlington & Quincy; G. W. Wall, electrical foreman, Delaware, Lackawanna & Western Railroad; M. A. Pinney, assistant electrical engineer, Pennsylvania; H. W. Wreford, train lighting engineer, Canadian National; J. A. Bucy, electrical supervisor, Baltimore & Ohio; J. W. Charpley, train lighting engineer, Canadian Pacific; R. A. Harrington, engineer train lighting, Chicago, Milwaukee, St. Paul & Pacific; and V. F. Dowden, engineer car electrical equipment, New York, New Haven & Hartford.

Discussion

The report was presented by Chairman L. J. Verbarg, (M. P.). W. S. H. Hamilton, (N. Y. C.), asked if the electric cooking loads listed in the report were based on straight electric, or electronic, cooking. Mr. Verbarg replied that it was for straight electric cooking only. Mr. Hamilton suggested that further study include the Raytheon diner. L. S. Billau, (B. & O.), suggested that the committee also look into the merits of infra-red cooking.

G. W. Wall, (D. L. & W.), said that the assignment on fuses and circuit breakers appeared simple but proved to be quite the contrary. Fuses and breakers, he said, are doing just what they are supposed to do, but locker temperatures were found to be much higher than anticipated, 115 deg. F. being common, and maximums going as high as 140 deg. F. It is necessary, he said, to have ventilated lockers of adequate dimensions. Exhaust ventilation, he explained, is useful only when the car is moving, and he offered the opinion that fan operation which is controlled by locker temperature is still the best method of ventilation.

The section of the report on fluorescent lamps, nickel-cadmium batteries, and intercall bell receptacles was presented by M. A. Pinney, (P.). He said that nickel-cadmium batteries tried by the Pennsylvania had satisfactory characteristics and that indications are that less flushing is required.

Mr. Hamilton, referring to damage caused by cinders on metal battery cans, said that protection can be provided by extra space in the battery box.

Mr. Pinney explained that the specifications for intercall bell receptacles correspond to those receptacles which have been used by the Pullman Company for a number of years.

The section of the report on caboose power supply was presented by L. C. Bowes, (C., R. I. & P.). He was asked if the air engine described in the report could operate for any considerable period of time from the reservoir after the caboose was separated from the train. He said it would be only a matter of minutes after which the communication sets would operate from the battery. In response to a question from Mr. Pinney, Mr. Bowes said that the air motor used was of the piston type, and that a vane type motor would be tried. Mr. Pinney said that such a device used on the Pennsylvania developed some trouble from the formation of ice in cold weather. Mr. Bowes said the Rock Island had had no such difficulty.

Mr. Hamilton expressed the opinion that the 60-watt generator used with the air motor might be too small. Mr. Bowes replied that it is sufficient only for communication purposes. The six-volt battery, Mr. Bowes said, has a capacity of 200 amp.-hr. Mr. Verbarg referred to a newly-developed drive employing a 600-watt generator, driven from a rubber doughnut riding a wheel.

L. H. Williamson, electrical engineer, Great Northern, said that his railroad employed a large number of belt drives using 400-watt generators, and 750-amp.-hr. batteries. The Great Northern, he said, tried a rubber wheel drive, but it would only run about one division, while the belt drive had been very satisfactory.

Car Air Conditioning

Concerning the subject of electronic filters the report states that the Burlington Lines report that they have their Twin-Cities Zephyrs equipped with Electro-Airmat filters and the cars for the California Zephyrs, which are joint trains between the Burlington, the Denver & Rio Grande Western and Western Pacific, are also equipped with them. In all they are specified on 76 cars, of which a large number have been delivered. These cars are also equipped with viscous type filters to remove the larger particles of dirt from the fresh air and recirculated air before it reaches the Electro-Airmat filters. These same cars are also equipped with odor absorbers on the down stream side of the Electro-Airmat filter. The amount of dirt collected on the Electro-Airmat filter paper depends on how dry the roadbed is. They are now renewing the filter paper in a minimum of about every six days, except in dining cars where the filter paper picks up more odors than it does in other cars and is consequently replaced more frequently. A mechanical loader is used at the terminal in renewing the filter papers. Due to the combination of this filtering and odor absorbing equipment, the air introduced into these cars is decidedly clean and free from all odors.

Forty-six cars are being built by The Budd Company for the Chesapeake & Ohio, wherein the Roto-Clone air cleaner, using ½-hp. motor, is being installed ahead of the Electro-Airmat filters in the fresh air for the removal of the larger particles of dirt. The railroad also has 250 more cars under consideration where the specifications call for the Roto-Clone air cleaner, but the type of filter to be used with same has not been decided upon.

The committee's attention was called to an article in the April, 1948, Reader's Digest in regard to the prevention of colds by passing air through Tri-Ethylene Glycol. The committee contacted the American Medical Association to ascertain if it was in a position to recommend its use for air purification service and it was stated that the article was merely a progress report, as their experimentation had not been conducted for a sufficiently long period of time to warrant positive conclusion as to the efficiency of the method.

Developments in Air Distribution

A new system of air distribution for non-air conditioned cars has been developed by Westinghouse Electric Corporation. This consists of a 23-in. airflow pressure ventilating fan, having an aluminum 10-bladed fan mounted directly on the motor shaft of a 25-0 Sturtevant railroad type motor. This motor fan unit is enclosed in an aluminum thimble on the bottom of which is attached diffusing vanes arranged at either 45 or 50-deg. discharge.

The thimble is of spun aluminum and is arranged to fit into the car interior with a minimum of effort and yet distribute the air in the optimum manner. The vane assembly that fastens to this thimble is made up of five circular aluminum vanes. These vanes are spot welded to the tube motor support arms. By removing the coverplate under the motor on this vane assembly, it is possible to service the motor brushes with a minimum of effort.

With the fan running at 860 r.p.m. the air volume delivered is 3,000 cu. ft. per min. at 2 in. static pressure. The motor input at 860 r.p.m. is .59 hp.

Five of these fans are installed on the ceiling on the

longitudinal center of the car—uniformly spaced to provide substantially uniform air distribution in the passenger plane. The movement of air over the skin of the passenger affords some cooling effect. Two sample cars of the Independent Subway System have been equipped.

Temperature and Humidity Control

The section of the report which is concerned with temperature and humidity control describes several recently developed types as follows:

Electronic Moduflow, developed by the Minneapolis-Honeywell Regulator Company, is based on the use of a resistance type thermostat, which forms one leg of a Wheatstone bridge which is normally balanced. As the air temperature of the car varies, the bridge is unbalanced, which causes proportionate changes in voltage to be applied to electronic relay, which, in turn, controls the operation of a motorized valve to meter the flow of steam to maintain the proper car temperature. A potentiometer is also connected to the gear train of the motorized valve and turns with it to rebalance the bridge when the supply of steam is sufficient to maintain the proper car temperature.

During the heating cycle, the basic heat is obtained from the overhead system, with sufficient heat supplied by the side-wall surface to counteract the cold windows and walls.

The action of the modulating steam valve on the overhead unit is controlled by three thermostats, (1) located in the fresh air intake, (2) located in the return air connection, and (3) located in the discharge air from the heating coil. Starting with an outdoor temperature of 70-deg. F, the discharge air temperature will be 70-deg. F and for each 3-deg. drop in outdoor temperature, the discharge temperature is increased 1-deg. Final correction in discharge temperature is made by the return air thermostat to maintain correct car temperature.

The side wall heating surface consists of finned tubing filled with liquid, which is heated by a steam heat exchanger. The liquid is circulated by means of an electrically driven pump. The modulating steam valve is controlled by a thermostat in the liquid leaving the heat exchanger. This thermostat has its control point determined by a window thermostat. Starting with an outdoor temperature of 70-deg. F, the liquid temperature of 70-deg. F is increased slightly over one degree for each degree drop in window temperature.

Panel heating may be obtained by allowing the air to rise from the floor heating surface by ascending in the rear of the side panel and passing over the window pane.

In room type cars, individual room temperature can be obtained during the heating season by means of booster heating coils in the air supply to each of these rooms.

The humidity control element consists of a dual winding of wire on a plastic coated spool with a moisture sensitive compound. The resistance between the two metal wires depends on the moisture content which obtains in the compound. In this manner the resistance becomes a measurement of the moisture content of the air. This variation in resistance is used in the Wheatstone bridge to control the humidity by operating the refrigerating apparatus to overcool the air, and then reheat it before admission to the car to maintain comfort in the car. Several cars have been equipped with Minneapolis-Honeywell control.

Radar Control (Cycle Modulation) developed by the Vapor Heating Corporation, has two elements which cause the required amount of heat to be delivered to the car to maintain comfort in the car. These unique elements are a special type of finned radiation and a double bulb, single-tube thermostat.

The finned radiation has a feed pipe which extends to the far end of the radiation away from the supply valve. In mild weather there are frequent short impulses of steam supplied to the feed pipe, with the result that the surface temperature of the finned surface will be maintained at substantially 120 deg. F. from end to end. On the other hand, in very cold weather the impulses of steam are long and the temperature of the finned surface will be increased to approximately 212 deg. F.

The thermostat which accomplishes these cycles has a single mercury column with two bulbs, one under the influence of the car air and the other bulb is insulated and has an electric heater element which, when energized, adds heat to the mercury column, causing it to rise. The supply of energy to the heater element is fed through contacts of a control relay, which also has back contacts which feed energy to the feed admission valve. When the thermostat is satisfied, the relay is de-energized, heat is removed from the auxiliary bulb and energy is applied to the solenoid valve to close it. When the thermostat is not satisfied, the relay is energized, heat is applied to the auxiliary bulb and energy is removed from the solenoid valve, allowing it to open.

With this arrangement, whenever the mercury column breaks contact, the heat valve is opened, admitting an impulse of steam, but at the same instant energy is applied to the auxiliary bulb, tending to cause the mercury column to rise. This means that in mild weather, the "on" cycles are very short, because only a small amount of auxiliary heat is necessary to cause the mercury column to rise, whereas in cold weather the auxiliary heat must remain "on" a longer period of time to cause the mercury column to rise.

There are approximately 4,600 cars equipped with cycle modulation.

In room type cars, each room has its own section of finned radiation with cycle modulation.

The Fulton Sylphon system of modulated control of heating is predicated on utilizing the overhead heat as the base heat and supplementing this with steps of floor heat as the outside air temperature drops.

The overhead heating surface is supplied with steam by means of a modulating thermostat valve, which meters the steam to suit the requirements. This valve responds directly to the temperature of the discharge air, but it is also influenced by another element in the return air stream, so that the discharge air will be maintained within predetermined limits and the car will not be overheated in mild weather.

The steam valves for the floor heat are of the "hot-chamber," normally open type. When the floor thermostat is satisfied, it energizes a resistor wrapped around a thermal bulb in the upper part of the valve. The electrical heat expands the liquid in this bulb and forces it into the bellows of the valve body, where the heat of the steam vaporizes the liquid and closes the valve.

In room type cars, each room has its own section of finned radiation controlled by a modulating thermostat valve, which can be adjusted by the occupant of the room to obtain the desired temperature.

On some room type sleeping cars, the main air supply is controlled at 60 deg. F and there is a small heater in the air duct to each room. The steam to this heater and to the floor heat surface is controlled by two modulating, self-operating valves. The setting of both valves is adjusted by a common knob, so that the valves for floor heat and the delivered air are set to control at the same temperature.

There are approximately 1,000 cars equipped with Fulton Sylphon control.

Fire-Resistant Filters

The committee has investigated the use of fire-resistant filters and has found none suitable for passenger car application. Even though fire-resistant filters may be produced, the problem of smoke from the burning of oil and dirt produces a hazard. The real solution to this problem lies in the more frequent cleaning of filters.

Several methods of interrupting air circulation in event of fire have been analyzed. It appears that the use of photo-electric cell has merit. It has been suggested that this device be located on the downstream side of the evaporator. This will consist of a light source, projecting a beam across the air-conditioning ducts, and a photo-cell looking at right angles to this light beam. The photo-cell will normally see no light, since it is looking across the light beam. With the presence of smoke in the light beam, however, the smoke particles will reflect the light and the photo-tube will observe the presence of smoke accordingly and actuate a relay to stop the fan and, if desired, close a multiple damper by means of a solenoid valve.

Hermetically-Sealed Units

Concerning the development of hermetically-sealed refrigerating units, the report states that such units are available

and now being used in drinking water installations and are giving satisfactory service. It also states that the Westinghouse Electric Corporation and E. A. Lundy Company have developed a system of passenger car air-conditioning equipment employing the use of two 5-hp. hermetically-sealed compressor units. These units must be supplied from a source of 220-volt 3-phase 60-cycle alternating current.

The report is signed by G. E. Hauss (*chairman*), electrical supervisor, Baltimore & Ohio; A. E. Voigt, car lighting and air conditioning engineer, Atchison, Topeka & Santa Fe; J. L. McMullen, electrical inspector, New York Central; W. A. Woodworth, general inspector air conditioning and car lighting, Southern Pacific; W. J. Madden, electrical foreman, Pennsylvania; J. L. Christen, yard department, The Pullman Company; D. C. Houston, electrical engineer, St. Louis-San Francisco; C. R. Bland, special engineer air conditioning and car electrical equipment, Chesapeake & Ohio; K. T. Benninger, general electrical supervisor, Chicago & Eastern Illinois; and R. W. Tonning, electrical engineer, Atlantic Coast Line.

Discussion

The report was presented by Chairman G. E. Hauss, (B. & O.), with A. E. Voigt, (A.T. & S.F.), presenting the section on air distribution and filters, and C. R. Bland, (C. & O.), presenting the section on temperature and humidity control.

Mr. Voigt asked how many months the Minneapolis-Honeywell equipment has been in service, and Mr. Bland replied that it has been used only as a test installation, and has run only a few times in regular service.

A discussion of the question of filter fires indicated that circumstances might, in one case, make it necessary to shut down the fan, and in another case, necessitate its continued operation. M. A. Pinney, (Pa.), suggested that the blower might be shut down from two different places manually. L. H. Williamson, (G.N.), described one case in which shutting down the blower would have left the car so filled with smoke that it would have been impossible to get into the car to cope with the fire. Chairman Hauss concluded that it is a problem for individual railroads.

Concerning the question of standardization on air conditioning units and parts, Mr. Hauss expressed the opinion that the manufacturers were not yet ready to consider this subject.

Application of Radio and Communication Systems to Rolling Stock

The committee was assigned the task of keeping in close touch with Committee 4, of the Communication Section of the A.A.R., assisting it as may be required in the development of information, specifications, etc., pertaining to radio or similar equipment intended for use on rolling stock.

It has been represented at all meetings of Communications Section Committee 4, "Radio and Allied Communications as Applied to Railroad Operations." Committee 4 appointed a Sub-Committee consisting of Mr. L. R. Thomas, Atchison, Topeka & Santa Fe R. R., *(chairman)*, Mr. G. M. Brown, New York Central System, Mr. P. B. Burley, Illinois Central R. R., and Mr. E. A. Dahl, Chicago, Rock Island and Pacific R. R., to consider several assignments and requested our cooperation. The assignments were: "General review of Section 12 of the Manual (Communications Section) with recommendations for such changes as may seem desirable," —"Investigate and prepare recommendations or specifications as deemed desirable covering the application of entertainment equipment—radio, telephone and all local reproduction type —for application to passenger trains," and "Design an improved type broadcast receiving antenna for streamlined trains to present an appearance in keeping with the equipment."

The committee met with this sub-committee and manufacturing representatives on several occasions and assisted in preparation of specifications which are included in the report.

Wires in Train Line Receptacles

In addition to the above work, at the request of a telephone manufacturer, the committee gave consideration to further assignment of wires in the communications train line receptacle No. 2 which is now in the Manual.

The assignments were as follows:

Terminal No.	Circuit
2	Battery positive (64 d. c.)
3	Battery negative (or common)
4	32-volt dial
5	64-volt dial
6	110-volt dial
7	Talking circuit
8	Talking circuit
13	Talking circuit (crew telephone)
14	Talking circuit (crew telephone)

Tentative approval of the above assignment was given the manufacturer subject to final action by the Section. The use of terminals 2, 3, 7 and 8 conform to the specification now in the Manual. Terminals 4, 5 and 6 had been reserved for telephone control but not specifically assigned. Terminals 13 and 14 are spare for use of anyone as desired.

At a conference between representatives of Aeronautical Radio, Inc., (who represent radio interests in the aeronautical field) and the Association of American Railroads in December 1946, it was agreed that any steps which could be taken to reduce the number of types of electron tubes and improve performance of such tubes with respect to reliability and service life would be highly desirable. It was further agreed that a small engineering sub-committee be formed to progress the matter. Mr. C. R. Banks, chief engineer, Aeronautical Radio, Inc., was designated chairman, and Messrs. L. E. Kearney, Communications Engineer, A.A.R., and G. M. Brown, Electronics Engineer, New York Central System, were designated representatives of A.A.R. on this sub-committee.

Two manufacturers have been interested in a long range program for the production of reliable vacuum tubes. Initially this program is limited to ten types of tubes, all miniatures. Design and engineering costs approximate $30,000 per tube type, which means that production volume must be high enough to amortize the initial expenditure. This also means that the number of tube types should be kept to a minimum.

The aeronautical people have selected the following ten types of tubes for ruggedizing with priority tentatively in the order listed: 6AK5, 2C51, 6AL5, 6AS6, 6BA5, a power output tube (2.5 watts, 9 pin base and good for RF to 160 Mc), a Hi-Mu (70-100) twin triode, 2D21, 6BE6, and tentatively, a modified 6AU6.

In conference with manufacturing representatives of Committee 4, agreement was reached on the following list of tubes to be considered for ruggedization and adoption as a preferred list for use in railroad communication equipment for both land and mobile stations: 6AK5, 6BA6, 6AS6, 2C51, 6AL5, a power amplifier (similar to 6AQ5) having a power output of at least 2.5 watts, on a 9-pin miniature base and good for RF to 160 Mc, 2D21, a twin triode having a mu of about 70, OA2W, 5R4WGY. It will be noted that all the above tubes with the exception of the last two are also on the list adopted by manufacturers of aeronautical radio equipment.

The program is proceeding and a number of pilot production runs of several types of tubes have been made. These are now out for service experience. Further information will be made available as the program progresses.

Program and Intercommunication Equipment

The committee's second assignment was to coordinate its activities with the Car Electrical Equipment, Locomotive Electrical Equipment, and Electric Rolling Stock Committees.

The Car Electrical Equipment Committee has been kept advised of meetings and progress of the work on specifications for program equipment on passenger trains.

The Automotive and Electric Rolling Stock Committee has been advised of the work to date on intercommunication

standards on cars. That committee has a sub-committee which is presently engaged in formulating recommended standards for the train line connections to Diesel locomotives.

There has been little activity this past year affecting the Locomotive Electrical Committee.

The report is signed by R. I. Fort, *(chairman)*, assistant research engineer, Illinois Central; F. E. Gould, equipment inspector, New York Central; W. S. Heath, assistant electrical foreman, Atchison, Topeka & Santa Fe; N. A. Passur, assistant engineer car construction, Southern Pacific; and D. F. Dunsmore, assistant electrical engineer, Chesapeake & Ohio.

Discussion

The report was presented by R. I. Fort, (I. C.). M. A. Pinney, (Pa.), asked if, in designing antennas for broadcast reception, the committee had made an effort to cover the requirements of railroads having electrified sections. Mr. Fort replied that the antenna in wood trunking and neon sign wiring cable, described in the report, would be acceptable. Mr. Pinney said it would be on the Pennsylvania.

It was also pointed out that the antenna consisting of coaxial cable supported on insulators seven inches from the roof can withstand 25,000 volts, and has been successfully in operation on electrified railroads.

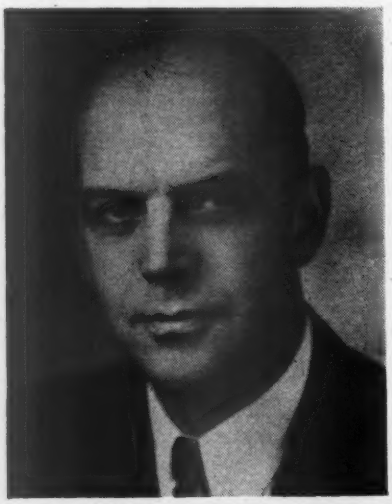
J. A. Bucy, (B. & O.), said that his road is now using a transformer at the point where the antenna enters the roof. In addition to being a protective device, the transformer improves reception.

A major part of the extensive report consists of specifications covering selection, installation, maintenance and general requirements for program source and distribution systems on passenger trains. These specifications correspond with those of the Communication Section, and it was the consensus of opinion that the Electrical Section would, with minor reservations, adopt these specifications when, as, and if, they are acceptable to the Communications Section.

W. S. H. Hamilton, (N. Y. C.), commented on the noise level control which raises and lowers the radio output volume in proportion to the noise in the car. He said this might more easily, and almost as effectively, be controlled by a contact on the reverse current relay, since noise reaches a maximum at about the speed the relay closes, and does not increase at higher speeds. Neither system, he said, provides for noise coming from the passengers, but this can be taken care of by a manually-operated switch giving a higher volume in one position than in another.

L. S. Billau, (B. & O.), said that the specifications should include not only the height of an antenna above the roof, but also take into consideration the height of the antenna above the rail, since some cars are higher than others.

Railway Electric Supply Manufacturers Association



L. A. Spangler

Officers

L. A. Spangler, *President,* Westinghouse Electric Corp., Chicago.
B. G. Durham, *Jr. Vice President,* Albert & J. M. Anderson Mfg. Co., Chicago.
John McC. Price, *Secretary-Treasurer,* Allen Bradley Company, Chicago

Directors

E. K. Lofton, *Chairman,* Dayton Rubber Manufacturing Company, Chicago.
C. G. Callow, Waukesha Motor Company, Waukesha, Wisconsin.
Wayne E. Lynch, General Electric Company, Chicago.
F. J. Burd, Cutler-Hammer, Inc., Chicago.
L. H. Gillick, Vapor Heating Corporation, Chicago.
W. L. Johnson, Crouse-Hinds Co., Chicago.
W. M. Adrian, Luminator, Inc., Chicago.
W. A. Ross, Pyle-National Co., Chicago.
A. E. Swedenborg, Benjamin Electric Mfg. Co., Chicago.

B. G. Durham

John McC. Price

E. K. Lofton

Electrical Manufacturers Exhibit

Thirty-eight members of the R.E.S.M.A. show products which emphasize the importance of electrical equipment in railroad operation

THE Railway Electric Supply Manufacturers Association held exhibits in the Hotel Sherman, on Wednesday, Thursday and Friday, September 8, 9 and 10, in conjunction with the meetings of the two A.A.R. Electrical Sections.

There were 38 exhibitors and approximately 265 manufacturers representatives in attendance.

At a business meeting of the Association, the following slate of officers was elected to serve during the coming year:

President: B. G. Durham, Albert & J. M. Anderson Mfg. Co., Chicago.

Senior Vice President: C. G. Callow, Waukesha Motor Company, Waukesha, Wisconsin.

Junior Vice President: E. K. Lofton, Dayton Rubber Company, Dayton, Ohio.

Secretary-Treasurer: John McC. Price, Allen-Bradley Company, Chicago.

Directors (for three years): C. A. Reeb, The Kerite Company, New York, N. Y.; E. K. Goldschmidt, Safety Car Heating & Lighting Co., Inc., New Haven, Conn.; J. F. Marquitz, Fairbanks, Morse & Co., Chicago.

The following is a list of the exhibitors, the products shown, and the representatives of each company:

AJAX-CONSOLIDATED COMPANY, Chicago, Ill.—Electroplating; Passenger car seats. Represented by: A. W. Donop, P. A. Cavett, J. A. Amos, Ralph W. Kelly.

ALLEN-BRADLEY COMPANY, Milwaukee, Wis.—Bulletin 609 Manual across-the-line starters; Bulletin 640 A.C. Semiautomatic resistance starters; Bulletin 700 A.C. Solenoid relays; Bulletin 709 Solenoid across-the-line starters; Bulletin 712 A.C. Combination starters; Bulletin 740 A.C. Automatic resistance starters; Bulletin 746 A.C. Automatic transformer type starters; Bulletin 800 Push Button control stations; Bulletin 801 A.C.-D.C. Limit switches. Represented by: John McC. Price, J. J. Mellon, H. Rosenkranz, R. C. Thompson, C. T. Roy, E. P. Weller, D. L. Anderson, G. A. Meyers, J. M. Rice.

ALBERT & J. M. ANDERSON MFG. CO., Boston, Mass.—Plugs and receptacles for A.C. stand-by service, 100 ampere and 60 ampere capacity. Also battery charging plugs and receptacles; Welding accessories; Multi-taps and BSC Plug Boards; Eitherend cable connectors. Represented by: Barry G. Durham, P. H. McNay, F. C. Messenger, James B. Luck, Benjamin Hamilton, Ray Roth.

APPLETON ELECTRIC COMPANY, Chicago, Ill.—Complete line of Conduit Fittings, for use in hazardous and also nonhazardous locations; Plugs and receptacles; Seal Line Switches; Automatic Take-up and Pay-out Reels known as the Reelite; Appleton Goodrich Lighting Equipment, floodlights, fixtures, spotlights. Represented by: E. A. Hakanson, Arthur I. Appleton, M. J. Whitfield, F. W. Wehrheim, Louis Fair, J. E. Whitfield, W. H. Ransone.

BECKER BROTHERS CARBON COMPANY, Cicero, Ill.—Carbon products. Represented by: M. P. Rosen, R. E. Fischel, M. E. Cadden, J. Lepman.

BENJAMIN ELECTRIC MFG. CO., DES PLAINS, ILL.—Represented by: A. E. Swedenborg, C. F. Strandberg, R. J. Mors, L. J. Cahill.

JAMES G. BIDDLE CO., Philadelphia, Pa.—Railway Bond Tester; "Megger" Ground Testers; "Megger" Insulation Testers; "Frahm" Resonant Reed Tachometers; "Frahm" Resonant Reed Frequency Meters; "Jagabi" Speed Measuring Instruments; "Jagabi" Rheostats; "Ducter" Law Resistance Ohmmeter. Represented by: A. F. Zell.

W. H. BRADY COMPANY, Milwaukee, Wis.—Exhibiting. Quick-Label Self-adhesive labels for marking wires; Coding signal and control systems; Identifying circuits, conduits, motor leads; Product identity through name plates and numerous other items requiring pressure-sentitive labels. Represented by: W. H. Brady, Jr., W. J. Tuite, A. F. Williams.

BUSSMAN MANUFACTURING CO., St. Louis, Mo.—Buss Fusetrons; Buss Fustats: Super-lag Renewable Fuses and Accessories. Represented by: A. A. Sommer, L. E. Edwards, E. J. Gasser, C. E. Grover, C. H. Sinn.

CROUSE-HINDS COMPANY, Syracuse, N. Y.—Condulets; Floodlights. Represented by: W. L. Johnson, R. P. Northup, W. J. Klaus, P. H. Massman, W. J. Byers, R. N. Ervin, R. H. Goodwin.

CUTLER-HAMMER, INC., Milwaukee, Wis.—Controllers for Diesel locomotives; Pushbutton Stations; Safety Switches; Type "M" Magnetic Brake; Dur-ristors; Renewal Parts; Contractor Coils; Represented by: F. J. Burd, R. J. Davis, E. Singler, L. P. Niessen, J. S. Trudgeon.

THE DAYTON RUBBER COMPANY, Dayton, Ohio.—Complete line of V-Belts, which give top-notch performance on all power transmission drives in the railway field. These include drives for air conditioning, car-lighting, compressors, generators, and auxiliary drives for passenger cars, Diesel engines, and cabooses. Daytons are made in both connector type and endless belts for all types of railway applications. Represented by: E. K. Lofton, Keith Covell, Jr., Tim Stikkers, C. J. Hoover, M. D. Coate, George Anderson, Walter Bosko.

THOMAS A. EDISON INCORPORATED, EDISON STORAGE BATTERY DIVISION, West Orange, N. J.—Recently developed rollout cradle type installation of Edison Nickel Iron Alkaline Storage Battery for Railway passenger cars; Edison battery for large electric industrial truck installation; Edison batteries for motorized hand truck installations. Represented by: L. R. Oswald, J. J. Hughes, J. A. Mustard, R. H. Weeks, Jr., O. A. Neidermeyer, L. F. Hawkey, L. E. Gunther, C. E. Singleton, D. G. Ihrig, F. D. Lansdell, J. C. Johnson.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa.—Exide Ironclad batteries for carlighting, air conditioning, Diesel cranking and for Electric Industrial trucks; accessory equipment for proper battery maintenance. Represented by: W. R. Knappenberger, R. Whitehurst, E. Taylor,

G. F. Krause, W. O. Cronk, C. A. Baunt, C. W. Wilson, H. G. Campbell, C. B. McCormick, L. M. Gay, W. B. Bowie, A. E. Leiferman, H. H. Warren, T. G. Tynan, H. F. Sauer, W. E. Dunn, R. F. Wilgus, J. D. Fischer, R. O. Miles, W. C. Hooven, W. H. Payne, T. H. Dooling, G. V. Cripps, W. O. Hahne, R. W. Seymour, E. H. Watkins, C. H. Osborn, H. Pryor, E. Ruus.

Farr Company, Los Angeles, Calif.-Chicago, Ill.—Air Filter Equipment; Air Handling Equipment. Represented by: R. S. Farr, W. H. Welty, H. J. Kennedy.

General Electric Company, Schenectady, N. Y.—Under-car power plant equipment; Amplidyne booster inverters; Snow melters; Heating cable; Leak detector; Speedometers; Floodlights, etc. Represented by: Wayne E. Lynch, W. C. Brown, C. C. Bailey, N. W. Seip, J. K. Pike, J. E. Wilson, A. I. Butler, J. J. Huether, F. H. Craton, C. A. Church, L. J. Mohler, A. Fisher, H. H. Helmbright.

General Electric Supply Corporation, Chicago, Ill.—Electrical Wiring, Power and miscellaneous items. Represented by: E. E. Stolp, A. J. Lutz.

Gould Storage Battery Corporation, Trenton, N. J.—Storage batteries for all railway applications. Represented by: H. S. Carlsen, R. C. Cragg, C. W. Hanna, W. W. Halsey, H. A. Mathews, J. A. Gilruth, R. E. Kinnen, W. H. Burkey, W. H. Radeke.

Harvey Hubbell, Inc., Bridgeport, Conn. — Electrical Wiring Devices. Represented by: R. L. Renaud, J. W. Davis, F. W. Gannette, B. F. Meyers.

K. W. Battery Company, Inc., Chicago, Ill.—Design and construction of various parts used in batteries for railroad use. Represented by: O. R. Hildebrant, E. L. Ettenger, W. B. Loewenherz, B. E. Wurtmann.

Loeffelholz Company, Milwaukee, Wis.—Passenger car electrical train line lighting equipment and lighting fixtures. Represented by: John S. Taylor, Nick J. Nowicki, Paul A. Bernhardt, Conrad A. Lischeron.

Luminator, Inc., Chicago, Ill.—Lighting equipment for railway passenger cars. Represented by: Albert L. Arenberg, Louis Sisskind, Wm. M. Adrian, Robert G. Nordquist, Vernon H. Heins, Emmett E. Kraybill, Norbert H. Schwenkler, Orval W. Rahn, Lyle N. Snavely, Leslie C. Brewer, Edward C. Zimmerman, Ray Lewen.

E. A. Lundy Company, Inc., New York, N. Y.—Aerofuse Outlets; Electric Water Coolers; Air Conditioning Apparatus; Excel Generator Drive. Represented by: Edgar L. Morris, E. A. Lundy, B. S. Williams, George Berger.

Mines Equipment Company, St. Louis, Mo.—Molded Neoprene Rubber Electrical Connectors especially designed for railroad application; Cable Vulcanizers; Molded Rubber Lighting Power and Control Harnesses. Represented by: H. B. Zeppenfeld, R. J. Ruhl, F. A. Bartosh, C. R. Martin, C. G. Howard, J. P. Gould.

Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.—Electronic Car Temperature Control equipment, including: Electronic thermostat to illustrate principle in Electronic Moduflow, side of railway car with inset window showing model of a space thermostat. Represented by: Maurice R. Eastin, C. M. Sanders, A. G. Buckley, Dick Luchtman, F. B. Conlon, Earle Barker.

National Electric Coil Co., Columbus, Ohio—Complete set of Silicone armature and equalizer coils and winding supplies for a high speed Diesel electric locomotive traction motor; Set of Silicone armature coils nested on a dummy core so that the shape, size, material, etc., can be readily observed; Electronic bar-to-bar armature tester for detecting short circuits in traction motors and car lighting and air conditioning armatures; A redesigned 20 KW air conditioning armature that enables the railroad passenger car to operate under present day overloaded conditions; An infra-red heater for comparing varnished cambric, varnished glass cloth and Silicone varnished glass cloth heat stability. The latter cloth is used in recently developed Diesel electric locomotive traction motor armature coils that are creating attention among users of this type of equipment. Represented by: J. H. Chevalier, B. E. Price, D. E. Stafford, J. W. Miller.

The Okonite Company, Chicago, Ill.—All classes and types of insulated wires and cables, friction and rubber tapes. Represented by: A. L. McNeill, J. P. Galvin, G. P. Cady, J. J. O'Brien, H. Hogan, P. J. Salerno.

The Pyle-National Company, Chicago, Ill.—Conduit Fittings; Plugs and Receptacles; Headlights; Turbo-Generators; Floodlights; Gyralites (Train Warning Signals); Multi-Vent. Represented by: W. A. Ross, J. V. Baker, A. L. Berlin, C. H. Barton, W. W. Booth, M. M. Connell, F. M. Currie, W. H. East, H. V. Engh, W. M. Graves, E. H. Hagensick, A. C. Hehler, T. J. Little, G. J. Loewe, E. G. Peterson, G. K. Raider, J. L. Reese, R. C. Vilas, W. A. Wulle, T. W. Milligan.

Railway Mechanical Engineer, New York, N. Y.—Publications. Represented by: S. W. Hickey, A. G. Oehler, F. J. Fischer, E. L. Woodward, G. J. Weihofen, W. G. Downie, F. W. Smith, G. A. Murphy, Jr.

Railway Purchases and Stores, Chicago, Ill.—Publications. Represented by: Edward Wray, K. F. Sheeran, J. P. Murphy, Jr.

Safety Car Heating & Lighting Company, Inc., New Haven, Conn.—Car Lighting and Air Conditioning Equipment. Represented by: E. K. Goldschmidt, C. W. T. Stuart, J. J. Kennedy, C. A. Pinyerd, H. K. Williams, Jr., H. R. Medland, C. E. Hughes.

Spicer Manufacturing Division of Dana Corporation, Toledo, Ohio—Generator gear drive; Propeller shaft and universal joint; Safety clutch; Automatic clutch. All of the above shown in cut-away assembly of the Spicer Positive Railway Generator Drive mounted to simulate installation in cars of 57 railroads. Represented by: R. P. Lewis, L. J. O'Brien, J. A. Lindberg, R. E. Sellick.

Square D Company, Milwaukee, Wis.-Detroit, Mich.—Circuit Breaker Panel Boards for Light and Power distribution; Buss and Feeder Duct; Standard Line of Magnetic Starters and Contactors; D.C. industrial truck control; Miscellaneous items such as Timer, Pressure Switches, Push Buttons, etc. Represented by: N. J. Driscoll, J. L. Thompson, W. W. McKinnon, J. D. Worley, M. E. McConnell, J. F. Hruby.

T-Z Railway Equipment Co. for Witte Engine Works, Kansas City, Mo.—Witte "Dieselectric" Plant. Represented by: G. S. Turner, Jr., M. E. Nicklin.

Vapor Heating Corporation, Chicago, Ill.—No. OK-4616 Vapor-Clarkson Steam Generator (non-operative); Display of Loop System with modulated control for car heating; Relay exibit board showing different types of relays (operative); Shutter control (hydraulic type); Section of trench type heating equipment. Represented by: D. A. Brundage; L. H. Gillick; J. T. Clark; F. B. Rutherford; R. J. Armbrust; J. A. Christ; G. M. Egart, W. W. Orr, E. A. Russell, G. C. Scott.

Waukesha Motor Company, Railway Division, Waukesha, Wis.—Diesel-Alternator, 25-KW, 220-Volt, AC System; 5-10 Ton Electric Condensing Unit for 220-Volt AC System. Represented by: C. G. Callow, L. W. Melcher, N. H. Willis, P. W. Mantz, N. Kawatski.

Western Lithograph Company, Los Angeles, Calif.—E-Z-Code Brand Wire Markers; E-Z-Code Brand Cable, Conduit and Pipe Markers. Represented by: Jerry Bishop, E. T. Turney, Jr., Royal A. Stemm, L. M. Wood, J. E. Oliphant.

Westinghouse Electric Corporation, Pittsburgh, Pa.—Refrigeration Compressor (Hermetically-sealed); Pressure Ventilating Axiflo Fan; AB Breaker Display; Rectox Portable Battery Charger; Water Cooler. Represented by: J. A. Schoch, L. A. Spangler, W. G. Brooks, W. R. Jacobs, W. R. Sugg, H. F. Stroberg, F. J. Hamilton, C. A. Schmidt, T. C. Finnell, D. W. Dean, H. E. Dralle, H. H. Hanft, B. M. Brown, R. W. Crothers, W. D. Shepherd, J. E. Murphey.

Coordinated Mechanical Meetings

Opening joint session of five member associations is addressed by J. H. Aydelott, vice-president, A.A.R.

On the afternoon of the opening day of the Coordinated Mechanical Associations' 1948 annual meeting, held at Hotel Sherman, Chicago, September 20 to 22 inclusive, a joint session was held in which the five member groups —Air Brake Association; Car Department Officers' Association; Locomotive Maintenance Officers' Association; Master Boiler Makers' Association and the Railway Fuel and Traveling Engineers' Association—participated. A total of about 1,200 members and guests were present.

J. E. Goodwin, vice-president and executive assistant to the president, C. & N. W., served as chairman of the meeting and introduced J. M. Nicholson, mechanical assistant to vice-president, A. T. & S. F., who made some brief complimentary remarks in presenting honorary life membership in the Coordinated Mechanical Associations to John M. Hall, director, Bureau of Locomotive Inspection, I. C. C.

At the request of Chairman Goodwin, V. R. Hawthorne, executive vice-chairman, A. A. R. Mechanical Division, made a similar presentation to F. E. Roesch who was an important factor in early, as well as more recent, efforts to coordinate the activities of railroad associations in the mechanical field.

Chairman Goodwin then called on A. K. Galloway, general superintendent motive power and equipment, B. & O., and chairman of the A. A. R. Mechanical Division to introduce the principal speaker, J. H. Aydelott, vice-president, A. A. R. Operations and Maintenance Departments. Following Mr. Aydelott's address, Chairman Goodwin explained that his new position and duties on the C. & N. W. preclude further active participation as an officer of the Coordinated Mechanical Associations which, however, will always have his full interest and support.

Rising Costs Necessitate Economy

Record-breaking expenditures for equipment and facilities for maintenance mean more intensive studies must be made to assure greatest return

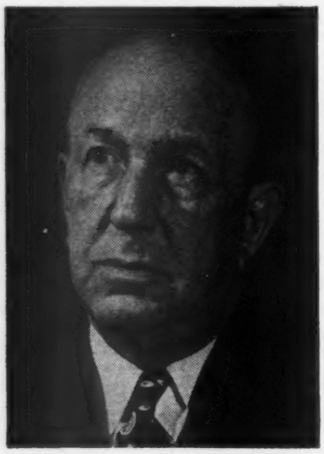
By J. H. Aydelott

Vice president, Operations and Maintenance Department, Association of American Railroads

The rising costs of both labor and material point to the necessity for the greatest economy possible in conducting these activities. They point further to the necessity for more training of subordinates as to ways and means in which to make better use of materials and to operate our locomotives and cars in service with proper consideration of their increased value and the obligation which their purpose has to the traveling and shipping public. The railroads today are in a highly competitive transportation field. They provide their own capital, make their own policies and therefore are free institutions. Their competitors enjoy public subsidies in one form or another. Airplanes are grounded in unfavorable weather; waterways freeze over during the winter monthse and cannot be used and our highway competitors using public roads depend on public authorities to build and to keep them serviceable. When heavy snows arrive, their operations are suspended until the highways are cleared. These circumstances are foreign to railroad operation because trains move with regularity regardless of weather or other conditions. In spite of the unfair advantages which other forms of transportation hold, the situation has not caused a diminishing of our enthusiasm or our energy in behalf of the railroad industry.

The year 1948 will show unprecedented expenditures by the railroads for new passenger and freight car equipment of the latest and most modern design and for locomotives of greater utility and with greater productive capacity than any heretofore known in the industry. Even a greater acquisition of new equipment, heavier rail, shop machinery and miscellaneous supplies would have been possible had steel been made readily available to meet our needs. In 1923 which was the peak year of rebuilding railroad equipment and facilities following World War I, the railroad field consumed over 31 per cent of the total output of finished rolled steel. During 1947 the industry

was able to secure only 7.7 per cent of the steel output and in no year since 1939 have we been able to secure as much as 10 per cent which is considered to be the absolute minimum if our requirements are to be fully met. In the two years, 1946 and 1947, our deliveries of new rail fell more than a million tons short of the orders that were placed with the rail mills. Of course, during the war years very little steel was made available to the railroads outside of the essential quantity required for maintenance of locomotives and cars with the result that as to freight car equipment the end of the war found railroads faced with the necessity of scrapping many thousands of freight



J. H. Aydelott

cars and even with the construction goal of 10,000 new freight cars per month having been reached on July 1 of this year, we had lost since VJ Day net a total of 49,000 cars.

That the railroads have successfully handled a post-war traffic in a volume far exceeding the estimates made as to its size has been due to the fact that the output from our repair tracks of cars receiving general repairs has risen in recent months to as high as 40,000 cars per month. It is likely that the retirement of freight cars will continue at a high rate for some months to come since many thousands of cars have reached the age and condition where further repairs can no longer be justified.

We are deeply conscious of the cost of the units now being purchased and that it will be necessary to secure the longest possible life and one that will be consistent with this increased cost.

In keeping with the situation, the research activities being conducted by the Association of American Railroads and by many of the railroads individually have been expanded and during the current year some very important field tests will have been completed to involve trucks of new design, the test of a newly developed load compensating air brake, and another for the purpose of determining the extent to which truck and axle failures, including hot bearings, may be attributed to poor wheel mounting practices and eccentricity of motion through out-of-round wheels. The hazards growing out of defective equipment in any moving train at present day speeds cannot be discounted.

Even greater strides have been made in the improvement of locomotives and among the subjects discussed concerning locomotive handling and maintenance, there are a number involving the Diesel locomotive.

The Diesel locomotive of today is no doubt far from the ultimate which the future will bring. Its chief attraction lies in its availability and in its low axle load as compared to steam locomotives of the same capacity. Ways must be found to lower the fuel consumption both in Diesel locomotives and in steam locomotives and to avoid in the latter the losses in power from generation to output at the drawbar.

What About Oil?

It is hoped that research relating to the Diesel locomotive will develop that these locomotives can burn a lower grade of fuel and get more mileage out of it. While the economic results from this substitution cannot be calculated, there is public interest involved in view of the competition which has developed for the lighter oils commonly used for the heating of homes and offices. The steam locomotive burning fuel oil at the moment is not in an enviable position and it appears that substitution for the Diesel engine or the coal-burning engine is inevitable not only because of the expense of operation but improved refinery processes may greatly reduce the supply of oil of a quality that has thus far been used in these locomotives. It appears from the record that 1 gal. of light oil used by a Diesel locomotive will produce a ton mile equivalent of 5 gal. of residual oil used in a steam locomotive.

Performance Records

New records are being made every day by the railroads in the matter of locomotive and train performance. During the first six months of 1948 the average load per freight train was 1,153 tons, the previous high record being for the year 1947 when it was 1,146 tons. In 1929 the average was only 804 tons. In tons of freight moved one mile for each hour of freight train operation, the average for the first six months of 1948 was 18,212, highest on record. This figure compares with 10,580 ton miles in the year 1929 and 7,303 in 1920.

The number of freight cars handled per train averaged 53.7 in the first six months of 1948, this also being the highest on record. In producing this record our railroads seem to have lost very little in the average speed of trains. It is the same now as it was in 1946 and 1947 although the speed was a trifle higher during the war years.

Not only is the Association of American Railroads expanding its research activities in the field of maintenance and operation but in responding to the apparent need of the railroad industry for a better understanding on the part of the public of its activities and service, it has arranged for a radio program, nation-wide in scope, that will be initiated on Monday, October 4, and will appear each week thereafter on Monday nights.

Our research programs will be greatly implemented with the construction of our own laboratory on the campus of the Illinois Institute of Technology at Chicago—the building and equipment representing an expenditure of $600,000. In addition, we will continue to farm out much of our research work to universities and other establishments which are equipped for this purpose. There will also be sizable contributions made to other research institutions in the field of air conditioning and for the development of ways and means by which the life of our cross ties and switch ties may be lengthened. It is well to keep in mind that applied research which is the type we handle has its origin in the suggestions and recommendations received from the men who use the material in the track, locomotives and cars for which it is purchased. Each mechanic, no less than the foremen and yourselves, can foster research. The American railroads are in the leadership in the field of transportation today because they have been progressive and seized upon every opportunity to improve their plant and equipment by such means as were made available to them. They owe much to you men who direct the activities in the various mechanical groups, and your versatility in mastering the equipment of new designs and structure.

Election of Officers

At the concluding sessions of the Coordinated Associations meetings, the following officers were elected for 1948-49:

Air Brake Association.—President, R. G. Webb, superintendent air brakes, Chicago, Milwaukee, St. Paul & Pacific; first vice-president, C. E. Miller, superintendent air brakes and steam heat, New York Central System; second vice-president, F. C. Wenk, superintendent air brakes, Atlantic Coast Line; third vice-president, L. A. Stanton, general air-brake instructor, Great Northern; secretary-treasurer, L. Wilcox. Executive Committee: D. R. Collins, superintendent air brakes, Denver & Rio Grande Western; C. C. Maynard, chief inspector, Canadian National.

Car Department Officers' Association.—President, P. J. Hogan, supervisor car inspection and maintenance, New York, New Haven & Hartford; vice-presidents: G. H. Wells, assistant to superintendent car department, Northern Pacific; J. A. Deppe, superintendent car department, Chicago, Milwaukee, St. Paul & Pacific; J. D. Rezner, superintendent car department, Chicago, Burlington & Quincy; W. N. Messimer, superintendent equipment, Merchants Despatch Transportation Corporation; secretary-treasurer, F. H. Stremmel, assistant to secretary, Mechanical Division, Association of American Railroads.

Master Boiler Makers' Association.—President, E. H. Heidel, general boiler inspector, Chicago, Milwaukee, St. Paul & Pacific; vice-president, E. H. Gilley, general boiler foreman, Grand Trunk; secretary-treasurer, A. F. Stiglmeier, general supervisor boilers and welding, New York Central System.

Executive board members (for three-year terms): Chairman, E. H. Gilley, general boiler inspector, Grand Trunk; secretary, R. W. Barrett, chief boiler inspector, Canadian National; and B. G. Kantner, general boiler inspector, Reading. (For two-year term): F. R. Milligan, general boiler inspector, Canadian Pacific.

Railway Fuel and Traveling Engineers' Association.—President, G. B. Curtis, road foreman engineer, Richmond, Fredericksburg & Potomac; vice-presidents: G. E. Anderson, general fuel supervisor, Great Northern; W. E. Sample, superintendent fuel conservation, Baltimore & Ohio; W. D. Quarles, assistant chief motive power, Atlantic Coast Line. Executive committee: R. H. Francis, general road foreman equipment, St. Louis-San Francisco; F. T. McClure, supervisor air brakes, Atchison, Topeka & Santa Fe; R. D. Nicholson, road foreman engineer, New York, New Haven & Hartford; E. G. Sanders, fuel conservation engineer, Atchison, Topeka & Santa Fe.

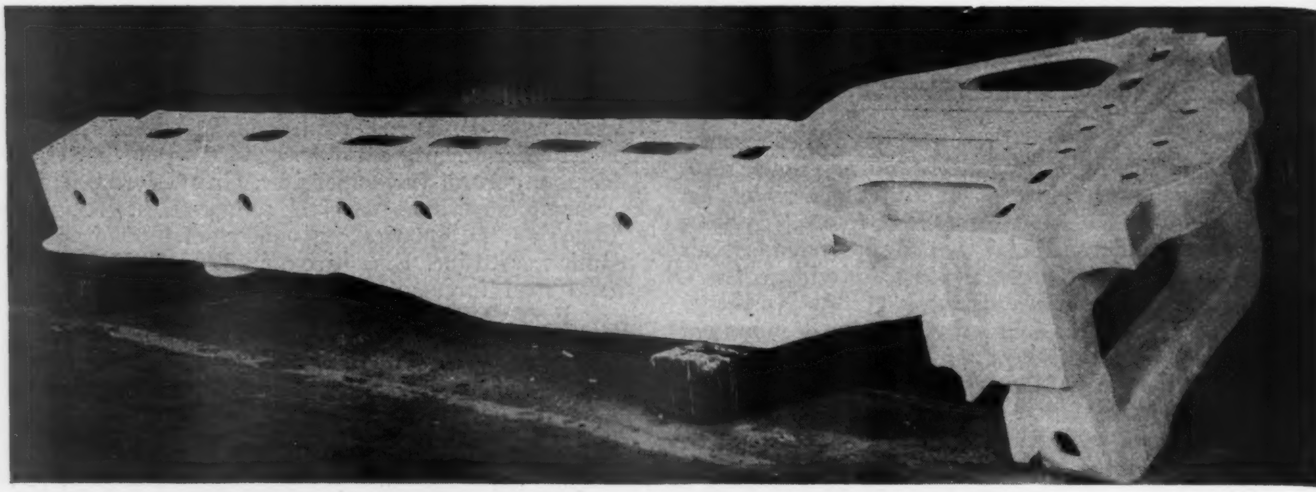
Locomotive Maintenance Officers' Association.—President, J. W. Hawthorne, superintendent of motive power, Central of Georgia; vice-president, G. E. Bennett, superintendent motive power, Chicago & Eastern Illinois; P. H. Verd, superintendent motive power & equipment, Elgin, Joliet & Eastern; H. H. Magill, superintendent locomotive and car shops, Chicago & North Western; secretary-treasurer, C. M. Lipscomb, assistant to schedule supervisor, Missouri Pacific.

T. C. Shortt, chief mechanical officer, New York, Chicago & St. Louis, is a new member of the Advisory Board.

Executive committee (for two-year terms): E. Abraham, assistant to superintendent motive power, Elgin, Joliet & Eastern; E. J. Crawford, superintendent motive power, Chicago & North Western; W. H. Ohnesorge, superintendent of shops, Boston & Maine. (For one-year terms): A. E. Rice, chief mechanical officer, Denver & Rio Grande Western; F. R. Denney, assistant mechanical superintendent, Texas & Pacific; and J. D. Loftis, chief of motive power & equipment, Atlantic Coast Line.

* * *

Courtesy of Nickel Plate



The General Steel Castings one-piece platform center sill

Missouri Pacific Buys 134

Passenger Cars for "Eagles"

Sleeping cars, head-end cars, and seven types of coaches, including dome coaches and two types of grill-coaches, among deliveries from three builders

THE passenger-car improvement program undertaken by the Missouri Pacific and the Texas & Pacific for the purpose of establishing "Eagle" passenger-train service between St. Louis, Memphis and the principal cities of Texas, and between Houston, Texas, and Brownsville involved orders for 134 passenger-train cars from three builders. The types, allocation and builders are shown in the table. American Car & Foundry Co. is delivering a total of 69 cars, including coaches of several types, diners, diner-lounges, grill coaches and head-end cars. Pullman-Standard Car Manufacturing Co. has built 47 sleeping cars of three types. The Budd Company is furnishing 10 coaches, of which three are planetarium dome cars, two diners and six sleeping cars.

The cars are streamline and conform to all Association of American Railroads' contour standards so they may be used freely in interchange service on any streamliner. The predominant exterior color is blue accentuated by gray window pier panels and gray skirts with a band of cream just below the drip rail for the full length of the cars, and another at the skid rail between the blue side and the gray skirt. This gives continuity to the train in which the cars are made up.

The Car Structures

The cars built by the American Car & Foundry Co. and Pullman-Standard Car Manufacturing Co. have low-alloy high-tensile steel underframes, and the superstructures are entirely of aluminum from the Aluminum Company of America, except those of the head-end cars which are of low-alloy high-tensile steel. The platform center sills and draft lugs, buffer castings and coupler carrier are Commonwealth integral castings of low-

One of the Commonwealth all-coil-spring trucks

Lightweight Streamlined Cars Ordered Since V-J Day For the "Eagle" Fleet

Type	Number of Cars M.P.	T.&P.	Total	Builder
R.P.O. mail-baggage	8	5	13	Amer. Car & Fdy.
Baggage-dormitory	1	5	6	Amer. Car & Fdy.
Dormitory coaches	4	....	4	Amer. Car & Fdy.
Grill coaches	2	....	2	Amer. Car & Fdy.
Stateroom coaches	6	....	6	Amer. Car & Fdy.
Standard coaches	3	....	3	Budd
Divided coaches	7	2	9	Amer. Car & Fdy.
De luxe coaches	1	11	12	Amer. Car & Fdy.
De luxe coaches	3	1	4	Budd
Coach-grill lounge	5	2	7	Amer. Car & Fdy.
Planetarium dome coaches	3	....	3	Budd
Diners	1	1	2	Amer. Car & Fdy.
Diner-lounge	5	3	8	Amer. Car & Fdy.
Diner-lounge	2	....	2	Budd
14-roomettes 4 double bedrooms	22	16	38	Pullman-Standard
14-roomettes 2-double bedrooms 1 drawing room	5	1	6	Pullman-Standard
5-double bedrooms—soda fountain lounge	1	2	3	Pullman-Standard
10-cabins 6 double bedrooms	6	....	6	Budd
Mail-bag coaches, diners lge...	51	30	81	
Sleeping cars	34	19	53	
Grand total	85	49	134	

The planetarium dome in the Budd-built coach

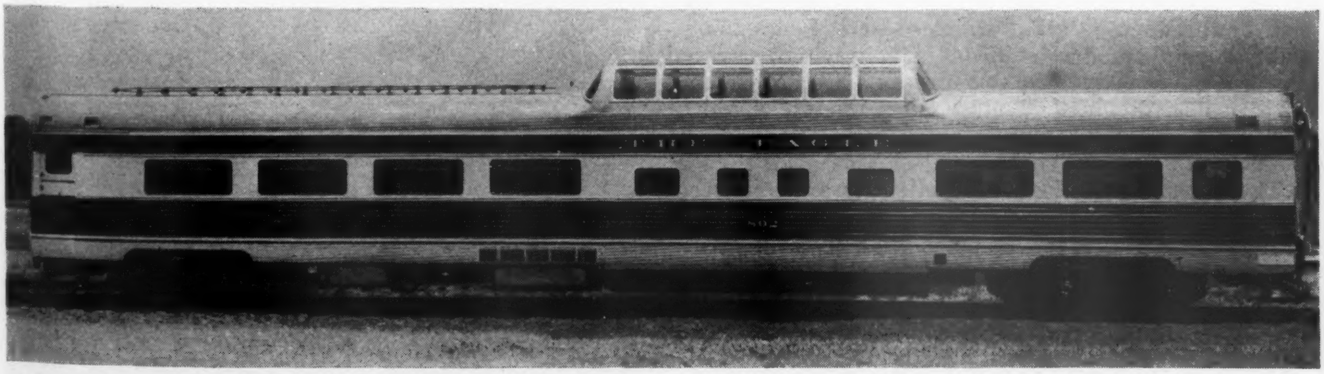
carbon alloy steel. The side sills, corner and end posts, side plates and end plates of the A.C.F. cars are of 17ST aluminum alloy; the side posts, carlines and purlines, of 61ST62. The side sills, end and side posts, and side plates of the Pullman-Standard cars are 17ST alloy; the carlines, 61ST62. The roof and side sheets of the cars from both builders are of 24ST3 alloy.

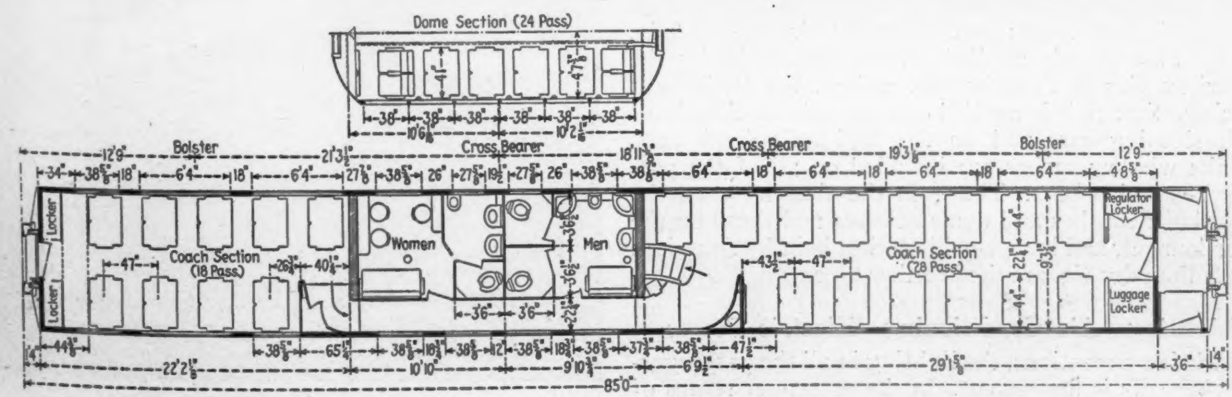
The floors of the A.C.F. passenger-carrying cars are Keystone filled with Tuco Beech Grove mix, covered with a ⅛-in. coat of Enamelite. Over this is applied 1¼ in. of Armstrong compressed cork. The Keystone flooring is supported on longitudinal Z-section stringers of No. 10 and 13 gauge, the latter under the seat pedestals. Insulation is between the 16-gauge stainless-steel false floor and the Keystone floor in all of these cars.

This floor is covered in the passenger compartment with carpet laid on sponge-rubber pads. Armstrong Marbelle linoleum is laid in the passageways, the lounge rooms, and all toilets.

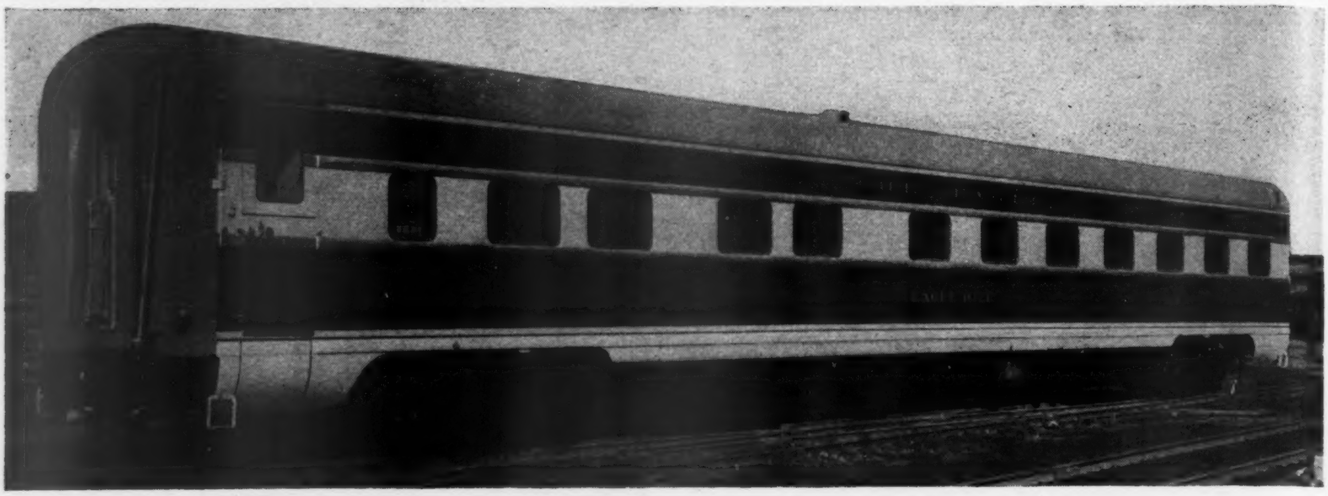
The floors in the baggage-compartments are laid with ¾-in. by 3¼-in. tongue-and-groove edge-grain fir, placed diagonally on the stringers and covered with the same material laid lengthwise. Between fish racks a third course of the same material is applied lengthwise; at the door openings this course is laid crosswise. Waterproof building paper is applied above the lower floor. Except the top floor in the mail compartment, all wood in the floor is treated with chromated zinc chloride.

The Budd-built cars are of Shotweld stainless-steel





On of the planetarium dome cars built by the Budd Company for the "Colorado Eagles"



One of the sleepers built for the Missouri Pacific and Texas & Pacific by the Pullman-Standard Car Manufacturing Company

construction. This includes the underframe, except from the bolsters outward which are weldments of alloy steel. To these the stainless-steel center sill is riveted inboard of the bolsters. The weldments also include end-sill collision-post connections and coupler carriers.

The stainless-steel center sill, which normally is unbroken between the bolsters, is interrupted at the structural partitions at the ends of the depressed floor under the dome of the planetarium dome cars. The load is transferred three ways: to a wide shallow center sill, which is welded at each end to the under side of the normal center sill; by a heavy floor structure at the partition end of the normal floor level, by which a part of the load is transferred to a heavy side sill on each side of the car.

The dome structure consists of box-section carlines which are divided into upper and lower members across the center of the roof. The air duct for the dome space passes between these members. The roof over this portion of the dome is a flat stainless-steel sheet. Longitudinal members divide the area between the curved carlines on each side in two parts. These are closed with rubber-mounted double curved-glass windows. Side plates are reinforced to carry the roof loads past the dome to the roof structure at either end of the car.

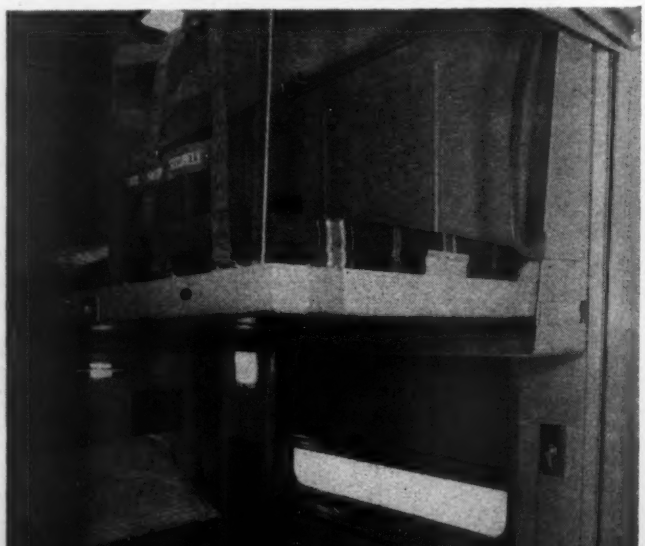
The car floors of the Budd-built cars are transverse stainless-steel pans welded to the center sills and braced by two cross beams spaced approximately equally distant between the bolsters and attached at the sides to the side sills. A ⅛-in. coat of Insulmat is sprayed on the metal surface and one this is laid 3½ in. of insulation. Above this is placed the plywood sub-floor, on which is applied the finished floor treatment.

The insulation in the roofs, sides, and end walls of all the cars is 3 in. thick; that about the air ducts is 1 in. thick. Fiberglas is applied on the cars built by the American Car & Foundry Co. and on the Budd-built coaches. Stonefelt is applied on the Pullman-Standard-built sleeping cars and on the Bud-built dome cars. Adlake window sashes are installed on all of the passenger-carrying cars. Those on the sleeping cars, the Budd-built coaches and dome coaches and those on the diner-lounges, and lounge-grill coaches built by American Car & Foundry Co. are the breather type.

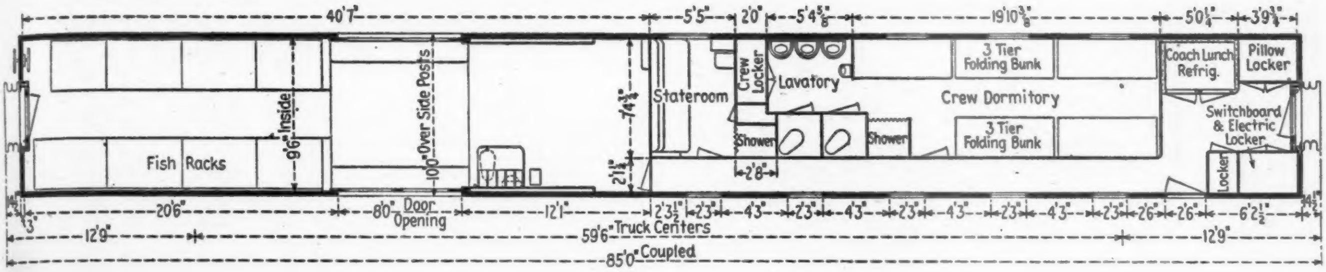
Lighting—Air Conditioning—Electric Power

With few exceptions, the lighting in all the passenger-carrying cars is fluorescent. In the passenger rooms of the coaches, this is arranged in rectangular fixtures along the center of the ceiling and in transverse units flush with the under side of the Luminator bag racks. In the Budd-built planetarium dome cars, lights are arranged longitudinally along both sides of the dome ceiling. Fluorescent lights are also installed in the passageways and lounges. Incandescent lamps are used in the annexes and washrooms, with fluorescent mirror lights in the latter. Incandescent lamps are in use in the vestibules and in the lockers. In the latter, they are operated by door switches.

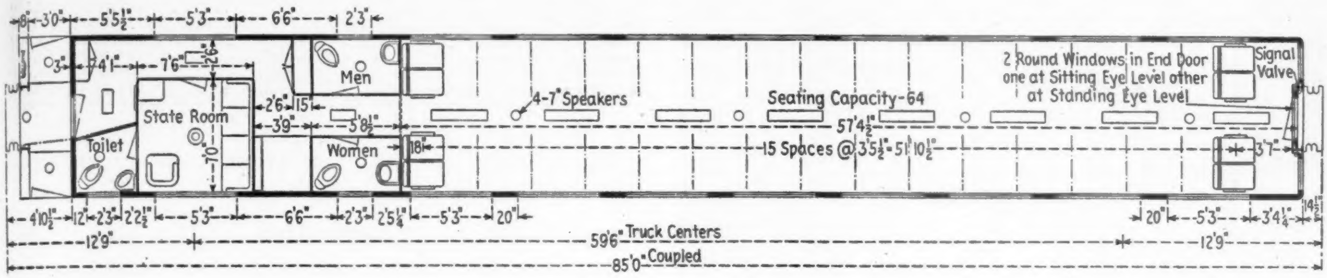
The air-conditioning equipment in all of the passenger-carrying cars is the Frigidaire electro-mechanical type. The equipment includes full-flooded condensers cooled by evaporation. The air-conditioning equipments in all of the coaches, except the Budd dome coaches, have capacities of eight tons. In the dome



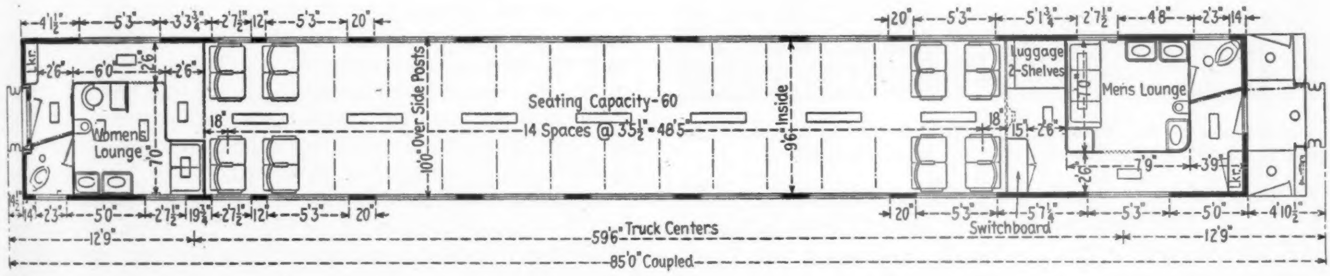
Longitudinal berths of the Pullman-Standard sleeper in lowered position



The baggage-dormitory cars provide bunks for a 15 man crew



The de luxe coaches have a stateroom at the vestibule end and observation windows at the opposite end



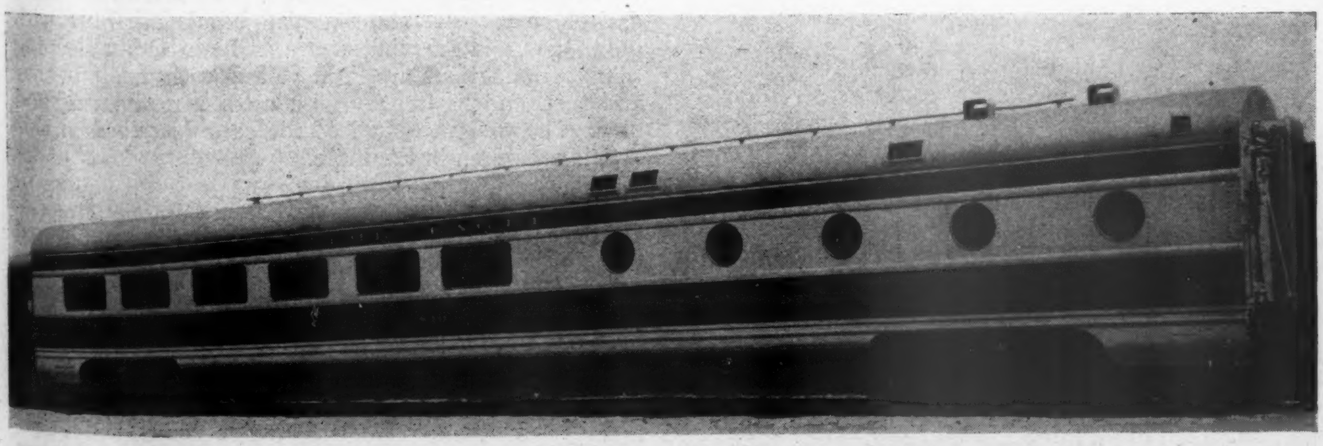
The 60-passenger undivided coaches have men's and women's lounges

Floor plans of three types of cars built by the American Car & Foundry Co. for the "Eagle" trains

coaches the capacity is 10 tons. The air circulation in the coaches is 2,400 cu. ft. per min. Fresh air constitutes 25 per cent of the total air delivery.

Electric power is supplied on the coaches by a 25-kw. Safety genemotor operating at 800 volts d.c. for the 64-volt incandescent lighting and air-conditioning systems. At the a.c. end of the genemotor is a 15-hp., 22-volt a.c. motor for standby power. The generator drives are the Spicer with hollow shaft and automatic clutch. For the fluorescent lights 100-volt a.c. current is provided by a 2.5-kw. motor alternator. A 300-watt Jeannette convertor supplies current for radio operation and utility outlets.

The trainline is 300,000 cir. mil. The main wiring is installed in a rigid galvanized conduit under the car. The storage batteries are 600-amp. hr. capacity. Gould batteries are installed on the sleeping cars, diners, diner-lounges, the baggage-dormitory cars, and all of the coaches or coach combinations, except 12 coaches built by the American Car & Foundry Co. and the Budd-



One of the two dining cars built by the American Car & Foundry Co. for the Missouri Pacific and Texas & Pacific

The kitchen in the lounge-grill coach built by the American Car & Foundry Co.—The service counter is at the left.

built coaches and dome coaches. These cars have Exide batteries. The mail-baggage cars have Edison batteries. All coaches and coach combinations, diners, and diner-lounges are equipped with R.C.A. radio. Loud speakers are placed in the ceilings. In the Budd dome cars a speaker is placed in the dome below the window at the end opposite the stairway. The coaches are wired for a public address system, to use the same speakers as the radio, and to be operated from other cars. The diners and diner-lounges are wired for the later installation of public address broadcast facilities.

Mechanical Equipment

The General Steel Castings four-wheel single-equalizer trucks having 9-ft. wheel base and fitted with roll stabilizers are a part of all these cars. All axles are 5½-in. by 10-in., except on the trucks at the kitchen end of the diners and diner-lounge cars and under the dome coaches. These are 6 in. by 11 in. All are equipped with Timken roller bearings except two grill coaches and six de luxe coaches for the St. Louis, Brownsville & Mexico, a subsidiary of the Missouri Pacific, which are Hyatt. The wheels are 36-in. high-carbon steel. Rubber sound-deadening pads are inserted under the center plate and side bearings and over the journal boxes. Rubber bumper pads are placed on the bolster ends. Fabreeka pads are inserted above and below the top and bottom spring seats.

The cars are heated by the Vapor zone-control system. The Vapor water heating system is also installed.

Westinghouse H.S.C. air brakes with D-22-B control valves provide a maximum braking ratio of 250 per cent of the light weight of the cars at 100 lb. cylinder pressure, except on two grill coaches, six de luxe coaches and two baggage-mail cars for use on the St. L. B. & M. The trucks have A.S.F. beam-type clasp brakes with two brake cylinders per truck. Each car has a Westinghouse genemotor type speed governor. The cars are fitted with National Malleable tightlock couplers and

Weights of Missouri Pacific and Texas & Pacific Cars for the "Eagle" Trains

Type of car	Builder	Railroad	Weights, Lb. Total,	Truck light
Baggage-dormitory	A.C.F.	Mo.P.	143,700	51,800
Baggage-dormitory	A.C.F.	T. & P.	143,140	51,800
Baggage-mail	A.C.F.	Mo.P.	131,420	51,300
Baggage-mail	A.C.F.	Mo.P.	130,600	51,300
Baggage-mail	A.C.F.	T. & P.	130,280	51,300
Undivided coach	A.C.F.	Mo.P.	123,500	38,560
Undivided coach	A.C.F.	T. & P.	123,245	38,569
Divided coach	A.C.F.	Mo.P.	125,300	38,560
Divided coach	A.C.F.	T. & P.	124,650	38,560
Diner	A.C.F.	Mo.P.	134,700	38,800
Diner	A.C.F.	T. & P.	132,600	38,800
Diner-lounge	A.C.F.	Mo.P.	131,220	38,800
Diner-lounge	A.C.F.	T. & P.	130,467	38,800
Dormitory coach	A.C.F.	Mo.P.	125,050	38,560
Lounge-grill coach	A.C.F.	Mo.P.	125,260	38,560
Lounge-grill coach	A.C.F.	T. & P.	124,600	38,560
64-passenger coach	Budd	....	125,000	37,500
Dome coach	Budd	....	144,000	41,000
Roomette-bedroom	Pull.-Std.	....	134,800	40,600
Bedroom-lounge	Pull.-Std.	....	125,600	38,750
Roomette-bedroom-drawing room	Pull.-Std.	....	134,900	40,500

yokes and the draft gears are Waughmat without separate buffers.

Decoration

Several color schemes have been carried out in the decoration of this equipment. Most of the coaches built by the American Car & Foundry Co. have yellow ceilings, tan side walls and end bulkheads, with rust upholstery, carpet in two-tone turquoise, and gold window shades. The same basic colors are employed on the lounge-grill coaches and grill coaches from the same builder, but varied by the use of the garnet carpets and, in the case of the grill coach, gray upholstery. In the two types of cars delivered by Budd the colors are cream on the ceiling, light blue sides with dark blue on the wainscot and end bulkheads. Carpets and upholstery, alike, are in two tones of dark blue. The window shades are opalescent silver and the drapes are predominantly blue with touches of other color in the pattern. The dome compartment of the planetarium dome coaches have pink ceilings, plum sides, a dull rose upholstery, and dark blue carpet.

Several combinations are employed in the bedrooms and roomettes of the Pullman-Standard built sleeping cars. These combine yellow ceilings, gray walls and upholstery with rust carpets and window shades; tan ceilings with blue walls and upholstery, with rust carpet and window shades; light apricot ceilings with medium apricot walls and green upholstery, carpet and window shades; light green ceilings, medium yellow walls, green carpet, and rust upholstery and window shades; light blue ceilings with medium tan walls, dark blue upholstery and window shades. The lounge of the bedroom-lounge car has light yellow ceiling, blue walls, chairs upholstered in red, gold and blue, and a dark blue carpet. The venetian blinds are blue with gold tapes, and the window drapes blue. Other sleeping room combinations are light yellow with medium gray and rust, and light gray with medium gray, rust and blue. The weights of all of the cars described in this article are given in the table.

Attendance at Railroad Fair Passes 2,000,000 Mark.—On the morning of September 4, a legless veteran passed through one of the turnstiles at the Railroad Fair in Chicago—the 2,000,000th customer to visit the exposition since its opening on July 20. He was awarded a round-trip, first-class tour for two via the Chicago, Rock Island & Pacific to Colorado Springs, Colo., and a week's stay at the Broadmoor Hotel in that city. At the close of business on September 13, the total paid attendance at the fair reached 2,069,940. The pageant had attracted 875,904 paying customers, and a total of 775,514 persons had ridden on the Deadwood Central narrow-gage line.

Rolling Wheels Gather No Rust*

By E. P. Gangewere†

A philosophy of mechanical department management which begins with supervisor selection and training, deals broadly with personnel relations and takes in planning the future of motive power and cars

The changing economic picture of our time requires a most diligent study of the daily production problems constantly before us. This is an age of relatively high operating and maintenance expenses, shortages of essential materials, in some cases considerable flexibility of delivery dates, excuses for work not properly performed—concisely stated, a period of instability. These are but the aftermath of recent world-wide events, and we are, all of us, carried along in this transition.

Our duty in the railroad field is to nourish a temper of optimism, and have that permeate through our daily contacts. What we get out of our daily contacts determines whether we have a good or mediocre performance.

In the mechanical department of any railroad the job is to keep equipment ready to roll upon the demands of the operating and traffic departments. Present-day requirements permit of no idle units.

In order to achieve better performance and meet prevailing uncertainties with a degree of certainty, the mechanical department of the Reading maintains numerous standards, records and some innovations which, with your permission, shall be reviewed at this time. Marksmanship is not obtained by star gazing, and neither are successful operating requirements met by inadequate current or long-range planning. This, then, is the subject of the first phase in the Reading's mechanical set-up, namely, company policy.

This policy is set after mature deliberation by our management and reflects through the various departmental heads, to their respective subordinate personnel. This is the cornerstone of our planning, and we all have the benefits of this sound business policy in the transaction of our daily affairs. For example, by way of illustration, one very important phase of our set-up is to bring an employee, who is slated for promotion, into conference with the major supervisor or department head, and outline to this individual the fundamental policies of the Reading. This is good salesmanship; it requires aggressiveness on the part of each major supervisor, and this, by exemplary action, passes along throughout the personnel. In the mechanical department, this starts with an apprentice who is to be promoted to gang foreman; a gang foreman who is to be promoted to assistant foreman, and so on. The superintendent of motive power spends about an hour in reviewing with the supervisor his responsibilities in accepting a promotion. This procedure is just an added step in continuing to sell the company to the individual who has merited further advancement. We are faced today, more than ever before, with the necessity of ultra-salesmanship to our personnel in order that often-misguided and misquoted statements may be better clarified and mental hazards of this nature more readily overcome.

A Five-Year Plan

In addition to the previous example of policy, we have, as another illustration, a five-year plan. Do not construe this as patterned after that of any foreign power. This is a five-year plan that is working, as we are now passing into the third year, with plan of the previous two having been fully consummated. I refer to our policy of retiring of obsolete equipment and acquisition of the new, not rolling stock alone, but fixed property and maintenance facilities as well.

This leads our discussion to the second phase of mechanical operation, which is personnel training. Frankly, I know of no better way, in 1948 or any other year, of guaranteeing an investment in our future than the training of employees, and this should begin with the apprentice course.

We have in our department 5,200 persons, of whom over 100 are apprentices ably guided by an efficient, exemplary instructor. In my short experience, the one outstanding quality which has had tremendous effect upon personnel to expect them to "do as I do" and not solely to "Do as I say." The supervisor must, by his fulfillment and acceptance of the implied title given him, set the example; actions always speak louder than words. Our apprentice courses have been the result of continued years of planning, as well as conferences with representatives of the shop-craft organizations. Courses are designed for each craft, with adequate classroom instructions and frequent practical examinations to test the progress of each individual. The apprentices maintain a definite social organization, to which affairs supervisory personnel are freely invited, and only too glad to accept as they promote that element of gold in human understanding which is good fellowship.

Supplementing this course, future supervision is trained with specific attention to younger men, who have shown innate qualities of ability to handle larger assignments. These young men are brought into the office of the departmental supervisor for further all-around training. It is an inherent quality of human existence, especially in our country, that among any group of individuals there are those whose personality, ability, foresightedness, respect of position and age, shine a little brighter than some of their contemporaries. It is up to major supervisors to capitalize on these distinctive qualities.

We have a weekly staff meeting, under the jurisdiction of the superintendent of motive power, at which the general operations of the past week are reviewed and future construction work and shop programs covered. These staff meetings are not over one and one-half hours in length and are attended each week by a different group, approximately 20 individuals. Subordinate officers, in turn, hold similar meetings with their groups. The definite and prime purpose of these short and snappy meetings is to get the information all the way down to the fellow who is actually doing the work.

*A paper presented before the New England Railroad Club at a meeting held in Boston, Mass., April 13, 1948.
†Superintendent motive power and rolling equipment, Reading Company.

The "Boosters' Club"

We have, as an overall aspect to the promotion of good fellowship, a Reading Company Boosters' Organization. At the present time, this club is headed by the general locomotive inspector, as president. We have laborers, mechanics, hostlers, foremen and top management in the organization, which holds various affairs throughout the year, at which officers from the entire railroad mingle and promote good will. This is significant for better performance.

One who has been eminently successful in his business career has related to me three words which will cover any successful operation. These are: organize, deputize and supervise. Only a small percentage of the job is done by issuing an order; the other big proportion consists in seeing and knowing that it is carried out. Possibly there are those who might say in this day and age that ten per cent consists in originating the order and 90 per cent in seeing that it is carried out.

Budget Control

As a means of executing these cardinal principles, a third feature of our mechanical-department operations is budget control. We have in physical equipment as of January 1, 1948, subject to direct or general supervisory control of the motive power department, four major and 13 minor power plants, two coal dumpers, 396 steam locomotives, 98 Diesels (including switching and freight units), 120 multiple-unit cars, 551 passenger cars (including 19 rail motor cars), and over 33,000 freight cars; in addition there are a number of units of floating equipment, such as tug boats, lighters, etc. In maintaining this equipment a definite monthly system of departmental expenditure is set up. The money, as allocated, is divided between labor and material, and is set up for each shop, enginehouse and power plant. Every officer in charge of a shop or repair point is provided with a full and complete statement of the entire budget for the mechanical department. He is in this respect not only a supervisor, capable of handling this work from a practical standpoint, but also one who is a manager from the viewpoint of business procedure. His knowledge of material costs is easy of attainment, as each storehouse is provided with material classifications, showing the individual pricing of the item used and, in this way, rising material costs are kept in public view at all times. The system of budgeting expenditures offers a most flexible method of keeping daily in touch with plant costs, and is a ready means of controlling these costs in line with current income. We are in a business to do better than simply "make ends meet", but to provide future working capital and enhance the position of the Reading as a first-class business enterprise.

We have found this system an efficient means of keeping our staff constantly alert to the unit costs of conducting transportation. It has been helpful in planning our work to meet current and anticipated business fluctuations. In the present age of "hide-and- seek" production costs, this is one way to know at any time what the maintenance-of-equipment ratio is.

The main shops of the railroad are located at Reading, Pa. About one-half of the mechanical personnel is employed in the general work of the department in that city. This leads us now to the fourth phase of our endeavor to provide rolling wheels which gather no rust: advance scheduling of back-shop production. Monthly programs are of necessity made up in advance, so as to provide adequate time for budget analysis. Data covering the allotted mileage for power, I.C.C. requirements, mechanical conditions and all other pertinent details are reviewed before making shop schedules. This pertains similarly to the car department, both freight and passenger. Building programs, whether locomotive or car, whether new or involving modernization, are dovetailed into the repair programs and adjustments in shop personnel made accordingly. A schedule, once made up and management approved, is to be met, and in the time limit specified, and on the basis of the money allocated.

As a practical example of this procedure it is worthy to review our method of building 30 modern steam locomotives beginning in 1945. This program was somewhat unusual from the following aspects:

We had a number of heavy Consolidation locomotives, which weighed over 70,000 lb. per axle, and were thus restricted in a number of important territories on our property because of bridge limitations. A long-range study indicated the advisability of having a modern universal steam freight locomotive to take up the slack and fit in with the Diesel program which we had inaugurated. The Consolidation locomotive had some assets, such as the outside wrapper sheet and portion of the combustion chamber, which could be efficiently used on our new Class T engines of the 4-8-4 design. Consistent with certain width, height, over-all length, and definite weight limitations between the trailer truck and front tender truck, 30 of these modern locomotives were built, having 70-in. driving wheels, 27-in. by 32-in. cylinders, 240 lb. steam pressure, one-piece bed section and roller bearings. All were completed in the latter part of 1946 at the estimated cost as originally formulated in the beginning of 1945.

We took the driving wheels from the Consolidation locomotive (which were 61½-in. in diameter), placed them under a smaller Consolidation unit, equipped the 4-8-4 locomotive with a new engine truck, lateral-motion device, increased the cylinder diameter, and changed the boiler pressure (we found by checking that the tractive force could thus even be slightly increased, as the boiler design permitted a pressure increase), and secured a more flexible unit for colliery service in our coal regions and heavy yard switching operations. The tenders from the original heavy-duty Consolidation locomotives were changed into auxiliary water tanks for supplemental use with existing power. These programs, together with our addition of Diesel switching and freight power, have paid off well in the elimination of obsolete units and the standardization of existing rolling stock.

Diesel Repairs at General Shop

The repairing of our Diesel locomotives is dovetailed into our general shop schedule at Reading. As we have considerable plant capacity in the form of building space of substantially modern design at our disposal, Diesel repairing is being expedited on a gradual conversion basis of these facilities. We have adapted, as an instance of this procedure, our Whiting hoist formerly used for Mallet repair work to the needs of our Diesel power, which has served admirably for this purpose. This conversion is not only working as indicated on a facility basis, but is also proceeding on a personnel basis in the same manner.

Now, a few remarks on how personnel training has paid off. Not many months ago, a mechanic approached me while on an inspection trip through our main shop and asked if we could start Diesel instruction classes for mechanics in the back shop; this gentleman stating that he had enlisted the names of some 25 to 30 men who were willing to spend their own time getting this instruction. This was, as you can readily understand, a most welcome proposal. The matter was properly cleared through the general chairmen of the shop crafts, we secured the services of the shop foreman in charge of Diesels, who is an adept instructor, and we had a series

of classes right in the Diesel section of our shop going on two nights per week, to learn the practical phases of Diesel repair work.

In our car shops (we have two large shops, one at Reading and one at St. Clair, near Pottsville, Pa.) during the year 1947, in addition to regular repair schedules of over 350 cars per month, we built 1,000 new A.A.R. type all-steel box cars, and began the conversion of a large number of our passenger cars into modern up-to-date units; this latter program continuing all of this year and into the next. We use the progressive system in car repair and building programs, all movements of cars from one spot to the next being set up on the second shift. A very close check is made on the cost of each series of cars in our ownership; a maximum cost being set up for repairs to each series, based upon the age of the cars. This serves as a guide to future schedules and as replacement data to keep our equipment up to a definite standard.

Innovations in Practice

Reference was made earlier to the use of some innovations in the handling of mechanical department work. A few of these processes for improvement will be mentioned.

A method of pumping a hot stripping and cleaning medium to overhead piping, permitting the solution to drop down over the sides of either a passenger car, freight car or locomotive tender, is employed. This readily removes all paint down to the bare metal in a very short period, reducing the number of employees from eight previously engaged in the work to two.

The reclamation of pipe has been given due consideration, and we have set up a spot in our car shop for the complete checking and reclaiming of usable pipe. Of particular interest is the elimination of pipe fittings. In building new cars or making extensive repairs to old cars, all pipe fittings are eliminated and connections made by welding, except to the air brake equipment proper, and at the train-line connections at the ends of the cars. An average of three to six pipe fittings are eliminated by this procedure on each car, depending upon type of unit.

The maintenance of Diesel equipment has been aided immeasurably by the assignment of several members of our test department to the daily checking of three items of Diesel locomotive diet, namely, lubricating oil, water and fuel oil. We have avoided frequent failures due to fuel oil dilution in the lubricating oil, stuck injectors due to a combination of fuel oil and lubricating oil characteristics. Radiator trouble, corrosion and cavitation problems have been surmounted through the proper testing and treating of water for Diesel power. By way of illumination in this connection, we found one water which was palatable for the human consumption, but was definitely injurious for Diesel locomotive use. An efficient, on-the-job test department is of incalculable value in the maintenance of steam and Diesel power.

A special test rack for accurately ascertaining what takes place in the cylinders of steam-driven air compressors has been set up in our air-brake department. This idea was developed by the foreman in charge of this department. Since its adoption, we do not have air-compressor failures.

Safety

One of the most important elements in the performance of our daily tasks is the element of personal safety. We have inaugurated a program which has been in effect for several years, and we feel that continued improvement will be forthcoming in this work, which is the sixth phase of our discussion.

We have shop safety organizations set up under the general guidance of a safety supervisor, reporting to the superintendent of motive power.

A safety rule book is furnished to each employee, and 10- to 15-minute safety talks are held each week by the foreman in charge of each department, before beginning the daily work. At these discussions the supervisors cover several rules and explain their practical meaning. In addition, each accident is thoroughly investigated to determine means of avoiding a similar one in the future. It is, of course, a cardinal rule, enforced by repeated on-the-ground checking, that a clean shop is the logical forerunner of a safe shop, and a pertinent principle of good workmanship. We have found the element of safety to be one of the most fruitful mediums of efficient plant management. Along these lines each departmental supervisor reviews with the shop-craft representation, and his supervisory personnel, safety procedures which can be inaugurated to better the accident record.

Planning the Future Equipment Inventory

Early in our discussion we referred to our five-year program. As we also stated previously, adequate planning is essential for future mechanical department efficiency. This is the seventh phase of our paper. We are endeavoring to maintain an unbiased, balanced outlook in the sense of procuring and allocating such new types of power and car equipment to profitably meet the transportation demands, as best we can foresee them. By the end of this year we will have completely Dieselized the symbol-freight service on one of our divisions, and supplemented our fast freight and heavy freight service on the other two divisions with Diesel power. Our switching service, exclusive of mine runs and certain local freight runs, will be practically Dieselized with 660- and 1,000-hp. units, the large majority of which comprise the 1,000-hp. size. In our steam passenger service, by the end of 1948, we will have two classes of steam power; the bulk of which will be of the Pacific type. We are at present building 10 new steam passenger locomotives in our shops at Reading, which will permit the retiring of older and smaller units. Due consideration was given in this program, on its inception, to a number of factors, some of which were:

1—Possible daily mileage with existing schedules and length of run. Most of our assignments average 90 to 120 miles in length.

2—Future retirement programs, which will involve some of our present older Pacifics.

3—Availability as dovetailed into present schedule requirements.

4—Original costs compared to internal-combustion power.

To strengthen further our suburban passenger service, we are adding to our present fleet of 100 multiple-unit power cars and 20 trailers 8 new power cars and 8 trailers. The new multiple-unit equipment will be of the "bride-and-groom" arrangement. The power cars will have four 500-hp. motors and, while the trailer cars are permanently attached through conventional couplers and jumper connections, they can be harmoniously operated in longer trains with our existing multiple-unit equipment.

We are giving serious consideration to present motive-power trends as there is ample room for a radical change in the utilization of steam as a prime mover. In addition, the continued efficient use of Diesel motive power is of prime importance and we feel that further contemplated improvements in steam-heating boiler design on Diesel passenger power will materially enhance the value of this particular type of equipment. We also feel that a

(*Continued on page* 96)

Gas Turbine Power*

By W. Giger†

Description of Allis-Chalmers 4,120 hp. gas turbine and two proposed locomotives of 3,000 hp. and 4,120 hp. the former designed to haul six-car train

WHEN talking about new type locomotives, one system that attracts considerable interest, among others, is that of the gas turbine locomotive.

Much has been published of the expected advantages of gas turbine locomotives compared with existing types of motive power, so that it seems needless to elaborate. Operating experience will show what can reasonably be expected of this new prime mover. A few expected advantages or deviations from existing types of locomotives may, however, be mentioned to round out this description.

As is well known, the steam locomotive of today, regardless of the splendid work it has done for over a century, operates at a low efficiency, while the Diesel locomotive, the prime mover with the highest efficiency, depends on a high-grade, quite expensive type of oil.

The gas turbine locomotive, as contemplated today, operates either on bunker oil or on coal. The comparison of the fuel costs for the three types of prime movers, including a gas turbine locomotive with a regenerator as large as can be built into a locomotive cab, as published by John I. Yellott, Director of Research of the Locomotive Development Committee, is shown in Table I.

This clearly indicates that the coal burning gas turbine locomotive, so far as fuel cost is concerned, will be the cheapest of all of them to operate, the fuel bill being almost one-third of that of a steam locomotive and somewhat less than one-half of that of a Diesel electric locomotive of the same rating. The great advantage of the coal burning gas turbine, of course, lies in the fact that the coal reserves of the United States alone, are enormous, compared to the dwindling reserves of the known world oil deposits. It is desirable that the coal used for the gas turbine locomotive be of the same kind as that dumped on the tenders of steam locomotives. This necessitates that coal conditioning equipment be carried on the locomotive which complicates the gas turbine locomotive somewhat when compared to an oil burning unit. However, the building of special expensive stationary plants to accomplish the same is avoided.

Initial and Operating Costs

There exists, up to now, only one gas turbine locomotive in operation, with a few more under construction in this country and abroad. The costs of these locomotives can, in no way, be representative of the costs that will be reached after this new locomotive type is out of its development stage and is being built in large numbers as is the case with other locomotive types today. However, we can roughly analyze the anticipated cost of gas turbine locomotives by taking into consideration that the mechanical parts and the electrical equipment (without gas turbine unit) will, no doubt, cost about the same for a coal burning gas turbine as for a Diesel-electric of the same rating. For an oil burning locomotive, the mechanical equipment will be somewhat shorter, lighter and cheaper than that of a Diesel-electric. The gas turbine unit itself, being a comparatively simple machine, we expect to cost not more than Diesel engines of similar rating. Many cost estimates made in the past for gas turbine locomotive projects lead us to believe that, on a quantity production basis, it will be possible to produce them at about the cost of Diesel-electric locomotives.

Operating costs of Diesel-electric and steam locomotives have been established and the general consensus seems to be that Diesel-electric locomotives show a considerable saving as compared to steam locomotives of similar rating, based upon present day methods of servicing of each type. Some indications are that operating costs of the Diesel locomotive are, in many cases, lower than those of a steam locomotive of similar rating, while others show practically the same cost for both types of locomotives.

The maintenance costs of the gas turbine locomotive should be lower than those of a Diesel locomotive, even when assuming that the maintenance of the mechanical and electrical parts is about the same as those for a Diesel-electric locomotive. Experience with a large number of gas turbines leads us to believe that the maintenance of the gas turbine plant will definitely be lower than that of a Diesel engine. This is easily understood if one realizes that the gas turbine contains no reciprocating parts and only very few bearings. The lubricating costs are practically negligible and the wear and tear of a turbine with no rubbing surfaces, water-jackets and all that goes with it, such as cooling radiators, pumps, etc., should be lower than that of Diesel engines. The maintenance and operating costs for a gas turbine locomotive, according to our estimates, should, therefore, be lower than those of a Diesel-electric locomotive and considerably lower than those of a steam locomotive of the same rating.

For the time being, the direct current electric system is used exclusively for the power transmission from the prime mover to the driving wheels. This system has shown its great flexibility and reliability in thousands of Diesel-electric locomotives.

This system is quite heavy and expensive, and it is quite possible that it will, in the future, be replaced by some kind of hydraulic or mechanical transmission. Such drives, however, have not been developed and

Table I—Comparison of Efficiencies and Fuel Costs

Type of Locomotive	Thermal efficiency at rail—Per cent	Fuel cost per 1,000 rail hp. hr.	Fuel cost cents per million B.T.U.
Modern steam locomotive	7	$5.47	15
Diesel electric locomotive	27	4.26	45
Gas-turbine locomotive, oil burning (Eastern United States)	21	3.64	30
Gas-turbine locomotive, oil burning (Western United States)	21	2.43	20
Gas-turbine locomotive, ccal burning	20	1.91	15

* Abstract of a paper presented before the Power Division of the American Society of Mechanical Engineers at a meeting held at Portland, Ore., September 7-9, 1948.

† Consulting Engineer, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

tested yet, for the power range involved in modern locomotives.

Coal Burning Gas Turbine Locomotives

Bituminous Coal Research, Incorporated, through its Locomotive Development Committee, have under way two coal burning gas turbine locomotives. A contract for the furnishing of one power plant for one of these locomotives was placed with the Allis-Chalmers Mfg. Company.

This turbine, now under construction, is of the open type and works with a maximum gas temperature of 1,300 F. at the turbine. With an atmospheric temperature of 70 F., at a speed of 5,700 r.p.m., the output at the turbine compressor shaft is 4,120 hp. A reduction gear is used to reduce the turbine speed of 5,700 r.p.m. to 2,000 r.p.m., suitable for the four direct current generators; and for the auxiliaries, which in case of the coal burning gas turbine, absorb about 245 hp., and which are supplied from three phase generators specially provided for, or mechanically driven as the case may be. A direct current auxiliary generator and an Allis-Chalmers Regulex exciter are connected to the gear housing, furnishing power for battery charging, control, and for the excitation of the main generators. Eight traction motors are connected in groups of two to each of the four generators. Two motors are permanently connected in parallel, thereby avoiding the transition. Two field shunting steps will be used. The load control of the locomotive will be of a type whereby the output of the generator is controlled in such a fashion that the gas turbine is always loaded to work at the proper speed and temperature, regardless of the speed of the locomotive.

Fig. 1 shows the Allis-Chalmers gas turbine plant now under construction, for this coal burning locomotive. It is equipped with a regenerator and at full load of 4,120 shp. and 70 F. atmospheric temperature and 1,300 F. gas temperature, should reach a fuel to gear input efficiency of 24 per cent.

Accounting for the auxiliaries, the losses in the gears, generators and traction motors, the efficiency of the locomotive at full load measured at the wheel rims, amounts to approximately 19 per cent. The starting of the gas turbine plant will be accomplished by means of a Diesel generating unit of 200 hp. rating. A direct current generator will feed two of the main generators, working as motors, in order to accelerate the turbine set to a speed where ignition of the fuel oil readily takes place. After the flame in the combustion chamber has been established with oil, the change-over to coal is made. The locomotive will be designed for a maximum speed of 110 m.p.h. and will have a starting tractive force of 127,000 lb. at speeds up to 4.5 m.p.h. The continuous tractive force will be 51,000 lb. at 22.5 m.p.h. and the one-hour rating 62,000 lb. at 17 m.p.h.

The coal handling, fly-ash separation and combustion chamber are being studied by the Alco Products Division of the American Locomotive Company while the mechanical parts of the locomotive are being designed by the American Locomotive Company.

Turbine Locomotive and Cars for High Speed

An effective way to operate at higher speed is to decrease the weight of the cars, and, at the same time, lower the center of gravity appreciably. The first measure permits the use of locomotives of lower ratings than would be the case with standard equipment. The lowering of the top of the cars by about 2½ ft. furthermore reduces the cross section of the train, and thereby reduces the air resistance of it. The lowering of the center of gravity permits the train speed to be raised without reducing the safety of operation.

The gas turbine, on account of its exceedingly smooth operation, is ideally suited for train operation. Having this in mind, also its comparative simplicity, when compared with other locomotive prime movers, we studied the application of a gas turbine to a high speed locomotive having an unusually low center of gravity and a low roof line, matching that with a new type lightweight passenger car. For these passenger cars the center of gravity has also been lowered by using wheels of smaller diameter than are presently used. This can be accomplished by lowering the floor of the cars and by

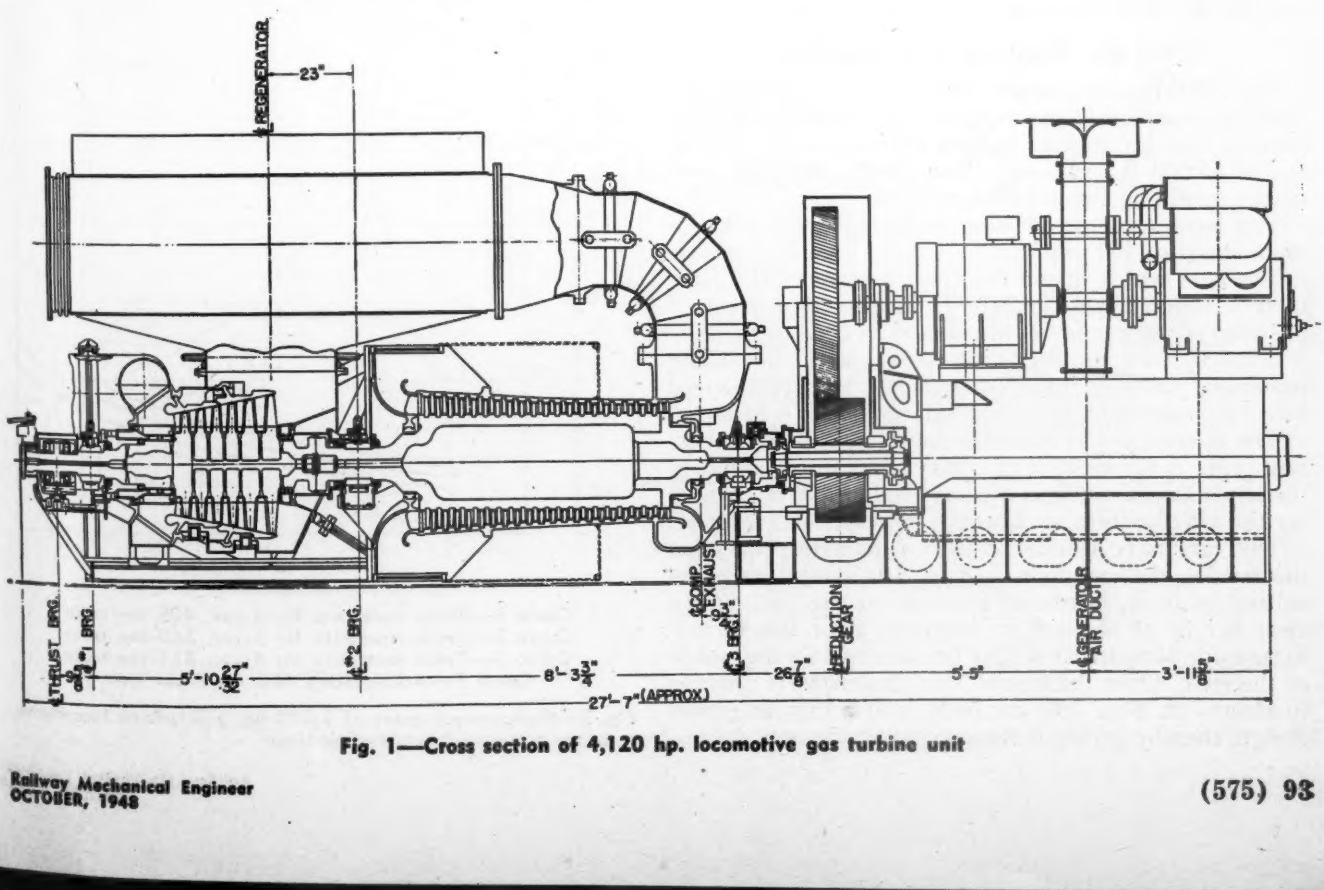


Fig. 1—Cross section of 4,120 hp. locomotive gas turbine unit

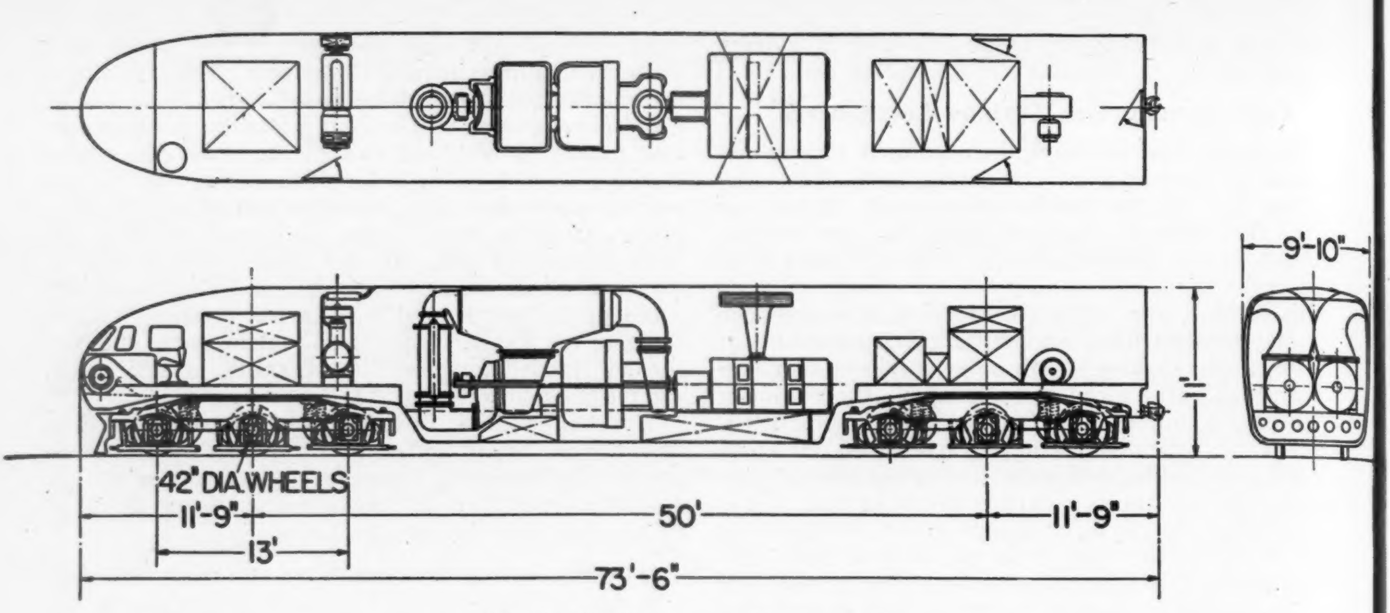


Fig. 2—3,000 hp. gas turbine locomotive

dropping the roof line to 11 ft. above the head of the rails, which is about 2½ ft. lower than that of cars now used.

The front of the locomotive is streamlined. In order to reduce the drag at high speed to a minimum, present with square car ends, the rear end of the last car is to be shaped to conform to aerodynamic requirements. The proposed locomotive for such a high speed train is shown in Fig. 2. It is equipped with a 3,000 hp. gas turbine and electric transmission.

To operate safely at high speed, it is of importance that the center of gravity of the vehicles be as low as possible. This locomotive was especially studied for this purpose and represents a unit having its center of gravity only 4 ft. above the head of the rails. This is from 1½ to 2 ft. less than that of presently used high-speed Diesel-electric locomotives and about 2½ to 3 ft. less than that of modern high-speed steam locomotives.

Fig. 3 shows the performance curves of this locomotive for speeds of up to 140 m.p.h.

3,000 Hp. High Speed Locomotive

The 3,000 hp. high-speed gas turbine locomotive contains an open cycle gas turbine. As proposed for oil burning, the locomotive weighs approximately 270,000 lb., or 45,000 lb. per axle. Two trucks are used, each truck containing two traction motors.

The locomotive in question is designed for a maximum speed of 150 m.p.h.

The cars which match the cross section of the locomotive, weigh approximately 45 tons. The number of passengers per car is 64, when used as coaches.

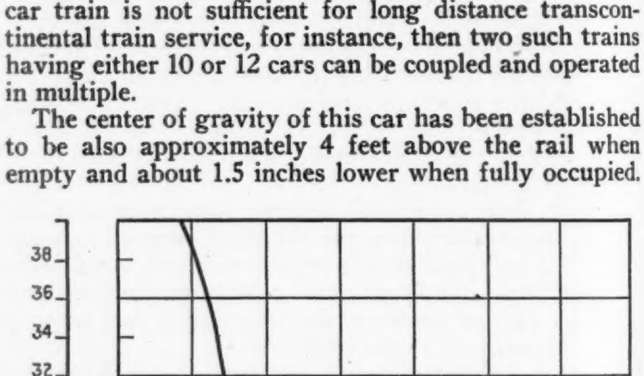
Since this locomotive, with the proposed low slung passenger cars, is intended primarily for high-speed inter-city operation, it should pull from 4 to 6 cars.

The electric power transmission is of the direct current type. A three-phase auxiliary generator of approximately 400 kva rating is used to produce electric power for the air conditioning, heating, hotwater and cooking.

The cars have wheels 28 inches diameter. Between the trucks, the car floor is 2 ft. 3 in. above rails resulting in 11 ft. height of the roof of the car, with a clear height of about 8 ft. from the floor line to any fixture for lamps that might be attached to the inside of the roof. Over the trucks, this dimension is reduced to about 7 ft. 8 in. The car body is of a tubular girder design, thereby giving it the necessary strength.

Estimates show that a car of this kind could be built with a total weight of approximately 45 tons. If a six car train is not sufficient for long distance transcontinental train service, for instance, then two such trains having either 10 or 12 cars can be coupled and operated in multiple.

The center of gravity of this car has been established to be also approximately 4 feet above the rail when empty and about 1.5 inches lower when fully occupied.



Curve 1—Train resistance for 6-car, 405-ton train
Curve 2—Train resistance for 5-car, 360-ton train
Curve 3—Train resistance for 4-car, 315-ton train
Curve T—Accelerating time for 5-car train

Fig. 3—Performance curve of 3,000 hp. gas turbine locomotive; train resistance and acceleration time

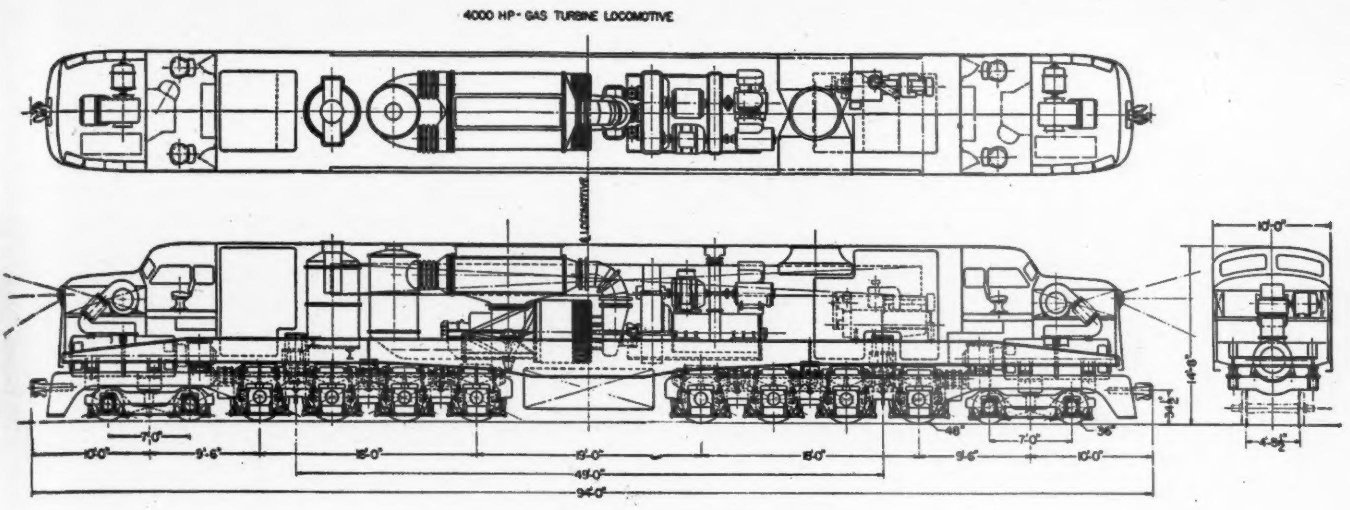


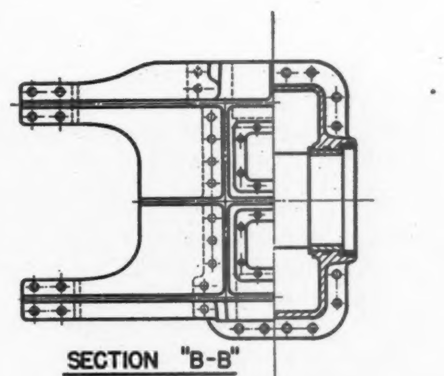
Fig. 4—4,000 hp. gas turbine locomotive

The safety of operation of such a train is demonstrated by the fact that the turnover speed on a curve of 2,000 ft. radius (2.87 deg.), and having 6.8 inches super-elevation, is approximately 144 m.p.h. while this critical speed drops to approximately 115 m.p.h. for a center of gravity of 6 ft. above rail, and to about 105 m.p.h. if it is 7 ft. above rail.

The low weight of these cars and of the gas turbine locomotive results in cheaper vehicles, that can, with safety, be operated at higher sustained speeds than is the case with presently used standard railroad equipment.

4,000 Hp. Gas Turbine Locomotive

Allis-Chalmers has also made a study of a 4,000 hp. oil burning gas turbine locomotive of a somewhat novel design. Many new features are proposed for this locomotive. These result in a locomotive which contains certain advantages not present in most of today's truck type locomotives. It consists essentially of a cab containing the power-plant, two operators' cabs, all necessary auxiliaries, some oil and water tanks, steam boiler and two main and guiding truck groups. The main trucks contain each 4 driving axles, one traction motor and the gear drives for the axles, and individual axle drives. The individual axle drive proposed is of a design, containing no springs and needing no lubrication. It does not affect the springing of the locomotive, and each axle can move up and down freely within the design limits of the journal box guides and spring deflection. Each driving axle is equipped with a worm drive reduction gear box, consisting of a large gear wheel mounted on a hollow quill shaft, which surrounds the axle, and a multi-thread worm. The four gear boxes are rigidly mounted in the main truck frame, that is above the springs, and are, therefore, not subjected to any blows or the continuous movement of the axles with respect to the truck frame. The drive shafts of these gear boxes are arranged in the longitudinal center line of the truck. All gear boxes are connected by means of flexible couplings. The driving motor of each



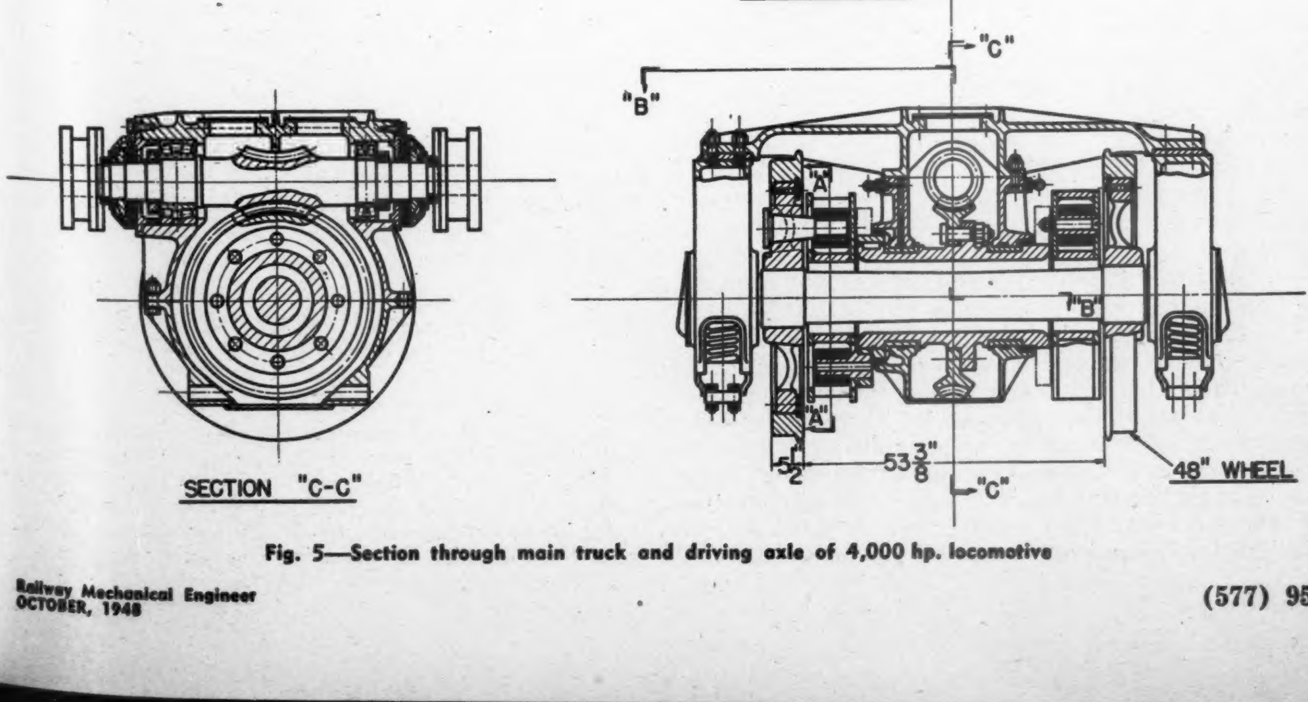


Fig. 5—Section through main truck and driving axle of 4,000 hp. locomotive

main truck frame is rigidly mounted on it, directly above the guiding truck, which is arranged at the outside end of each main truck. The traction motor blower is placed directly above the traction motor, but fastened to the nose construction of the locomotive cab. A short air duct with a flexible air connection connects the motor and the blower. The gas turbine to be used for this locomotive is much the same as that previously described. In this case, however, no fly ash separator is needed and the combustion chamber is directly connected to the regenerator located above the turbine and to the gas turbine intake.

The advantages that can be derived from a locomotive with this general arrangement are the following:

1. Any unloading of the front drivers, due to the application of a tractive force on the truck, is automatically compensated by an increased loading of the rear drivers. Individual axles cannot slip because they are all mechanically coupled by the main driving shaft. No reduction in tractive force takes place during starting and the danger of slipping wheels is greatly reduced.

2. The danger of locking wheels when the brakes are applied is also reduced, because all axles are coupled and, therefore, all axles must lock if over braking occurs.

3. Most dead weight is removed from the driving axle, thereby lowering the effects of blows, imposed upon it, by irregularities of the track.

4. Wear and tear of the worm reduction gear drive is reduced because the drive is mounted above the springs and rigidly connected to the truck frame.

5. Side thrust of the truck is reduced because the heavy motors are not located directly on the axle, but on the main truck frame above the springs and somewhat higher than nose suspended motors.

6. An individual axle drive requiring no lubrication at all, and which does not affect the springing of the truck is contemplated..

7. Alignment of the main drive shaft of each truck is assured, no universal joints are needed.

8. Only one traction motor is used for each main truck, or two per locomotive. The number of commutators, brush riggings, windings, etc., is thereby greatly reduced.

9. This traction motor is not subjected to so much dirt and dust, as is the case with nose suspended motors, and it is not subjected to the continuous blows from the axle. It can conveniently be inspected and maintenance is easy.

10. No air ducts for traction motor cooling air, along the locomotive frame, are needed, and the cable connections lead only to one motor per truck.

11. If only two traction motors are used, instead of eight of them, (as would be the case of a 4,000 hp. locomotive using nose suspended motors) these air ducts become very short.

12. The electrical circuits are simple, in fact only two reversers and very few motor contractors are needed.

13. 48 inch diameter driving wheels are proposed with a maximum axle loading of about 50,000 lb.

14. The simplification of the electrical equipment, the arrangement of the traction motors as proposed, rigidly mounted on the truck frame, and the application of individual axle drives, is expected to result in lower and easier maintenance of the locomotive.

The total weight of the locomotive has been estimated to be about 560,000 lb. The load on drivers amounts to about 8 x 50,000 = 400,000 lbs., whereas the guiding truck axles carry about 40,000 each, or 160,000 lbs. total. The maximum speed of the locomotive is 100 m.p.h.; tractive force at starting—122,000 lb. up to about 7.5 m.p.h.; tractive force, one hour—62,000 lbs. at 20.4 m.p.h.; tractive force, continuous—51,000 lbs. at 24.8 m.p.h.

It is quite clear that a coupled multiple drive arrangement, such as is proposed in this case for a gas turbine locomotive can also be used for electric locomotives of a similar structure.

[The conclusion of Mr. Giger's paper described a 3,000 kw. portable gas turbine power station—EDITOR]

Rolling Wheels

(*Continued from page* 91)

new prime mover (the gas turbine), while in its infancy as applied to American practice, has interesting and future practical possibilities.

Adequate tooling of shop facilities is of paramount consideration in improved maintenance. We have made a special study of a long range tooling program to meet this need. At present we have a number of up-to-date machine tools on order to facilitate economical and more accurate production methods, coexistent with roller bearing and Diesel maintenance.

Loyalty

In conclusion, I would like to speak of the eighth phase of our operation; it is that virtue which is so elusive in this day and age, the virtue of loyalty. Our policy in improving our performance is to instill in our personnel this vital element. We have endeavored to select the appointive positions on a basis of enhancing this virtue. We feel that personal salesmanship by each supervisor can advance this cause and in this way bring out the prime quality which results in an employee doing those things which not necessarily are always paid for but which he feels should be done to avoid failures or accidents and are in the main essential to the employees' and company's well-being.

Here is a practical example: We recently completed a new five-car passenger train in our shops. Our management, in order to show the well-merited appreciation to our employees who built this train, gave them a ride on its initial test run from Reading to Harrisburg and return. One hundred and sixty-eight of our passenger-shop employees were given this 120-mile ride on a Saturday morning, shortly after they had started work. Naturally this was a complete surprise to them, and the resulting effect on morale was most impressive.

That good American way of conscientious adherence to intelligent, progressive, exemplary leadership is not dormant but very much alive. Those who have the capacity for and are selected or promoted to exercise this leadership should do so wisely and humanely. Whether it be at work or play, our associates judge us, at least partly, in this manner:

It isn't whether you won or lost that is placed against your name; the thing that counts when the chips are down is how you played the game.

DIVISION 3 of the Interstate Commerce Commission has extended for another year—from January 1, 1949, to January 1, 1950—the period within which railroads must install AB brakes on all freight cars used in interchange service. The extension order, dated August 27, also fixes January 1, 1952, as the new deadline for equipping non-interchange cars.

EDITORIALS

Time For the Second Step

With over 50 welded locomotive boiler shells either in service or on order as of April 1 of this year, welding can be said to have taken its first major step not only in useful application to the locomotive boiler but in its acceptance by the railroads and by the Bureau of Locomotive Inspection. And now, because welding has proved itself successful in improving the boiler shell, it is an opportune time to consider the extension of this method of metal joining to other parts of the boiler where it can be employed profitably.

One field that seems ripe for the invasion of welding is securing staybolts in place, without the bolt previously being threaded. While seal welding the present-day threaded staybolt has been successful both in preventing leaks and in extending the life of firebox side sheets, and has thereby improved the insulation of the threaded staybolt, it should be considered more in the light of a temporary expedient than as the final solution to the staybolt problem. Threading is an unnecessary intermediate step; welding alone is strong enough to hold the staybolt without additional mechanical assistance from the threads. The unthreaded staybolt, welded in place, may very likely be developed to the extent where it will be far stronger and safer than the threaded staybolt, either with or without seal welding. This should be true with regard to fatigue strength as threading, like any other process which causes abrupt changes in cross section, renders a part substantially more vulnerable to fatigue failures.

Tests completed two years ago by a special A.S.M.E. committee have resulted in the acceptance of the fusion welded staybolt in lieu of the threaded bolt for power boilers. While the locomotive boiler is subjected to greater thermal stresses than the stationary boiler, the variation is one of degree rather than of basic difference. The comparative merits of the two types of staybolts as found in stationary boiler service should, therefore, hold generally true for locomotive boiler use.

One of the principal objections that may arise to more extended use of welding in railroad work, both on the part of railroad men and government regulating agencies, is that welding failures frequently result from poor workmanship rather than any inherent weakness in welding itself. Thus, while welding properly done may be satisfactory for a given job, its use may not meet with approval because of the risk of a defective weld and the difficulty of determining the soundness of the weld. Because of this, resistance to the welded staybolt may develop, and means of insuring proper workmanship must be found. With a system for insuring that the work will be done by competent welders and a series of operational standards for welding the threadless stays in place, there remains no inherent reason why welded threadless staybolts should fail to take their place with the all-welded firebox, welded patches on side sheets, the building up of worn staybolt holes by welding prior to rethreading, or the many other welding operations performed daily on important load-carrying members of cars and locomotives.

Production Principles

The rip-track spot system of repairs introduced by the Norfolk and Western at Bluefield, W. Va., as described in the September issue of the *Railway Mechanical Engineer* is a noteworthy achievement for two reasons. First, the system has stepped up the efficiency of this repair facility an estimated 25 per cent. Second, these results show that more consideration should be given to the application of established production principles in railroad maintenance work.

Without increasing the working force at Bluefield the number of cars repaired at this point during the first three months of 1948 was 4,839, an increase of 833 cars, or 20.7 per cent, over the 4,006 cars repaired in the first three months of 1947 before the new repair system was placed in operation. At the same time there was an increase in heavy repair work of 17.8 per cent. Because of this increase in heavy repairs it is difficult to make an actual comparison but it has been conservatively estimated that the over-all gain in car repair efficiency is 25 per cent. This gain in output is enough of a reason for looking into what was done to make this accomplishment possible.

The results are due to the application of production principles well known to the automotive industry where assembly lines are used extensively to move the work to the men and their tools. It also involves the use of mechanized material-handling equipment to eliminate much of the time and practically all of the heavy manual effort required to lift and move heavy car parts. It is obvious that the time required for

mechanics to move themselves and their tools from one location to another to get to the job is time during which no productive work can be performed on that job. Therefore, there has necessarily been a great deal of time wasted in the usual car repair yard for that purpose when the bad-order cars are scattered over long stretches of track. The N. & W. is moving the work to the men at Bluefield, by rolling the cars to the relatively small working area in which the repairs are made. Such a procedure permits the men to put in practically all of their time on the actual repair operations which naturally results in greater production per working day.

The material-handling problem has been solved by the use of mechanized material-handling equipment at many car repair yards where paved roadways have been installed. However, the Bluefield layout has two advantages over the usual rip-track set-up; the supply lines are shortened by the concentration of the work in a small area, and because of this situation the time saved by the material-handling equipment in actual transportation work can be utilized to good advantage by making the equipment available for assisting in the actual repair operations. Mobile cranes and lift trucks are invaluable for lifting and moving heavy repair parts into position on the cars. Another material-handling feature of the layout is the convenience of having all storage bins for small parts within a few steps of the repair work where the parts can be obtained easily without being carried by the workmen or without waiting for delivery by truck or cart.

While the stepping up in efficiency is important during this period of high wages the significant point about the Bluefield system is the fact that production principles have been applied intelligently to a phase of maintenance work which has always been handicapped by adverse working conditions. These same principles can be used effectively in any car repair yard.

Longer Motor Life

Some electric traction motors on electric locomotives have been run for more than thirty years without rewinding. They have not been dipped and baked, but only painted periodically with an air-drying varnish. This is apparently not practicable in the case of road Diesel traction motors, since they are worked much harder. It is common practice to bring traction motors into the shop every 200,000 miles for cleanups which include dipping and baking, and bringing worn parts back to size, and replacing bearings with others which have been rebuilt by the manufacturer. Rewinds are required about every fourth cleanup. It would be possible to so reduce motor loads that they would last indefinitely, but this would jeopardize an investment; the locomotives would not be able to earn their salt.

But there is much evidence being developed which indicates that periods between cleanups can be extended and motor life increased. Bearing failures which were once common, have been reduced to a point which indicates that they are not the limiting factor on mileage between cleanups. Improved insulating materials and better shop methods are also having a salutary effect. Perhaps most important of all is the education of locomotive operators—showing them how they can obtain maximum locomotive performance without undue shortening of motor and generator life. One of the frailties of the Diesel locomotive is that it can be abused without producing any immediate evidence that a failure is imminent. Conversely, by improving their operation, they can, in many cases, be made to produce more ton miles than they are at the present time.

One bit of evidence indicating potential increase of life was brought out at the discussion of the joint committee on motors, presented at the meeting of the two A. A. R. Electrical Sections, in Chicago, on September 15. One railroad reported having run a Diesel traction motor for 11 years and 4,000,000 miles before rewinding. The reasons for this length of service were not given, and apparently not known, but it serves as a bogie for what the railroads may eventually have as regular practice.

The Yardstick Is "No More!"

Not long ago a comment came to our attention that rather made us sit up and take notice because it was disturbing for it inferred that the men who have spent their lives building and repairing cars and locomotives have a deep-rooted prejudice against the accuracies which are accepted practice in many other industries such as the automotive, electrical and mochine tool.

It has long been a means of entertainment around conventions and other gatherings where railroad men are present to poke a little fun at the railroad shop man because he "builds locomotives with a two-foot rule or a yardstick on which there are no calibrations less than an eighth of an inch." Well, there are two sides to that story, too, for among our acquaintances is a well-known shop superintendent who came to the railroad industry after having spent a substantial part of his life in the automotive industry and he came with a zeal to find out for himself just why a locomotive couldn't be built without having a "pound in the boxes on the break-in run". He found out and, to use his own words, he "fitted the first two or three up so tight that they couldn't pull them out onto the transfer table".

Seriously, though, there are a lot of people who think that the railroad shop man doesn't know what a thousandth or a ten-thousandth of an inch means. Those people just don't seem to realize that in the hundreds of machine and fitting operations necessary on axles, rods, wheels, cylinders, motion work, air brake parts, reverse gear parts, throttle valves, injectors, etc., the shop man has been working to these tolerances for years. The amazing part of it all is that only the caliber

of a mechanic that one finds around a railroad shop could never work to such tolerances with the obsolete machine tools that many railroad managements think are "good enough".

Now comes the Diesel-electric locomotive and its hundreds of working parts fitted to thousandths and ten-thousandths. In fact, this publication carried an article on wheel work for Diesel power where the finish called for on a wheel hub was in micro-inches. The railroad didn't have a machine in the shop that could do a production job and deliver the accuracy required so it didn't temporize with progress or conditions—it just went out and bought a modern machine to do the job. That is what is going to have to be done in a lot more cases.

An Important Salvage Campaign

The week of October 3 has been designated as National Employ-the-Physically-Handicapped Week by President Truman's committee responsible for its observance. It will have passed before this issue reaches its readers. But the objective to which the week's observance is intended to draw attention will not have been accomplished; that requires the consideration of managements as well as supervisors all down the line and will take time.

The objective is to reclaim as many of the half million handicapped Americans, including 100,000 disabled veterans who are now unemployed or seeking new jobs, and the additional million handicapped Americans who could be made employable through medical service and training to prepare them for jobs suitable to their remaining abilities. This is a task for which railroads share responsibility with every other type of employing organization in America.

Specifically, the objectives of the week were (1) to promote employer acceptance of men and women with physical impairments; (2) to promote favorable attitudes toward these workers by the general public; (3) to make known rehabilitation and employment services now available to impaired workers through state employment services and state offices of vocational rehabilitation, and (4) to promote continued employment of the handicapped now working and raise the morale of those seeking work. Surveys show that men and women with physical handicaps can hold their own in many kinds of jobs, some of them highly specialized. A comparison made by the Department of Labor in co-operation with the Veteran's Administration of 11,000 physically handicapped workers and 18,000 able-bodied workers in 109 plants over a period of two years is said to have demonstrated that the handicapped workers, in jobs suited to their abilities, are as efficient, as stable, as reliable, as careful, and as versatile as the able-bodied workers with whom they were compared.

Physical handicaps are caused by the hazards of railway employment, though improvements in railway motive power and rolling stock, tracks and signals, including train control and communications, operating practices and safety movements have materially reduced the rate. Railroads have always found employment for at least some of those whose handicaps arose from accidents while in railway service. A careful study of the possibilities would, no doubt, make it possible for them to reach out beyond their own employees and take in some of the other physically handicapped workers available through statement employment or vocational education offices, certainly to their own advantage in periods of labor shortage. Such employees, once absorbed, may well set some new standards of loyalty.

Keeping Boilers Intact

A knowledge of the loss of life and property caused by the uncontrolled forces let loose when a crown sheet fails should be sufficient reason to make the railroads willing to take any possible action which would eliminate this waste of men and equipment. Some of the steps that could be taken were presented to the Mechanical Division meeting at Chicago by Commissioner Patterson of the Interstate Commerce Commission and John M. Hall, director of the I.C.C. Bureau of Locomotive Inspection. Their suggestions seemed more than reasonable when consideration is given to the seriousness of the situation.

Mr. Hall pointed out the need for issuing definite orders to the engineman to kill the fires when the crew members are confronted with a low-water situation. It seems absurd that some engine crews are willing to risk their own lives by gambling with an empty water glass but investigations prove that the willingness to take that chance does exist. A logical answer to this situation is the removal of the responsibility for traffic tie-ups from men with such poor judgment by issuing definite orders with an appropriate penalty for disobeying them—if the culprit survives.

Both Commissioner Patterson and Mr. Hall called attention to a lack of understanding on the part of enginemen in the functions and proper use of low-water alarms, fusible plugs and devices that improve the water circulation. Placing a piece of equipment on a locomotive without telling the enginemen what it is for and what it will do will not only limit its usefulness but may nullify completely its value. An engineman should know his locomotive.

It was also indicated that some installations of these safety devices have not been adequate for the purpose for which they were intended. Boiler explosions are too disastrous to permit any poor design work to creep into the picture. Furthermore, an inadequate installation could very well be worse than none at all because it could fool men into believing they have protection which actually doesn't exist.

All of the suggestions make sense and, if heeded, they should help to eliminate crown-sheet failures.

With the Car Foreman and Inspectors

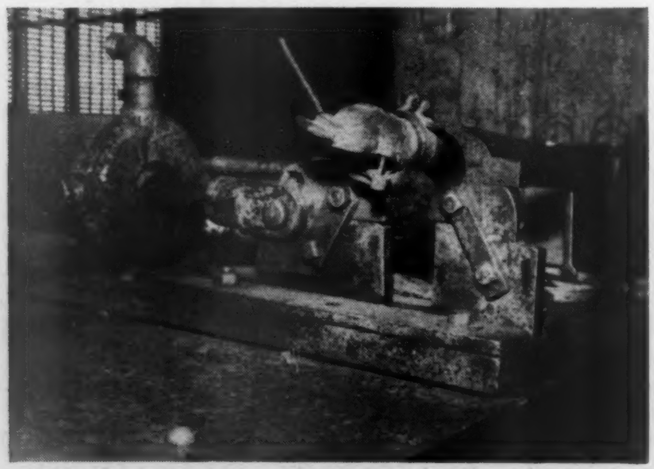
Air Hose and Steam-Heat Assembly

Two power-operated devices at the Kansas City Southern's Pittsburg, Kan., shop facilitate the assembly of air couplings, signal hoses and steam-heat connections. Both devices are equipped with easily and quickly interchangeable appurtenances that permit the performance of any assembling operation and some dissembling operations on any of the above three connections.

The blank hose rests in two blocks that are welded to the top of the bench and into the tops of which has been machined a semi-circular groove for holding the hoses. Two similar-shaped blocks clamp over the top of the hose and hold it securely in place for the application of the end fittings. The clamping force is supplied by a vertical air cylinder that is joined through a clevis at the piston rod to a 1-in. plate to which the top clamping blocks are bolted. With the hose clamped in this position, the end fittings are applied by two horizontal air cylinders bolted to the bench.

The various fittings on the different hoses are applied with the aid of adapters that screw on the ends of the two piston rods. The adapter for applying couplings is designed to hold the signal-hose coupling but is used also for the air-line coupling through the use of an easily applied filler piece. The coupling adapter is formed to a plate 7/16 in. thick and about 4½ in. long. The first 1¾ in. from the threaded end is 2½ in. wide and the last 2¾ in. is 2¾ in. wide. There is a slot ¼ in. by 1¾ in. in the end which, in combination with the non-straight-edge surface of the end, holds the coupler snugly on the adapter. Air pressure in the cylinder moves the piston rod and adapter outward and forces the coupler end into place on the hose.

Air-line couplings are applied in the same manner with the same equipment, but with one additional attachment that snaps in place. This is a filler piece to take



Device for gripping air- and signal-hose clamps to remove the clamp bolt—The heavier steam-line connection clamps are compressed on this same arrangement to facilitate removal of the clamp bolt

Coupling being applied to an air-line hose—In the foreground are convenient storage bins for couplings, clamps and nipples

up the greater space between the gasket seat and the member that holds the couplings together that exists in the air-hose coupling over the signal coupling. The filler piece is U-shaped with a distance between the insides of the two legs equal to the thickness of the coupler adapter. One leg of the filler piece is 2½ in. long and the other 1¼ in. The long leg fits between the gasket seat and the member that secures couplers together. It causes the air-hose coupler to fit snugly to the coupler adapter.

The air cylinder on the other end of the hose applies the nipple that goes on the one end of either the air or the signal hose and both nipples of steam-heat connections. One circular adapter that screws on the end of the piston rod is used for both air and signal hoses. This adapter is cylindrical and 2 in. long on the inside with an outside diameter of 2⅞ in. and an inside diameter of 1⅞ in. The nipple fits inside this and is forced into the hose by the air piston. The adapter opening is reduced to 1-3/16 in. by a bushing for holding signal-line nipples.

The steam-heat connection adapter threads to the piston rod. The nonthreaded end fits inside the nipple opening. Between the plain shaft and the threaded end is a collar which backs up the nipple while it is being forced into place in the hose. Both the straight and the offset nipples are applied with the same adapter. To align the offset nipple with the center line of the hose a "hillside" washer is used. The washer is 2½ in. in diameter and has one flat face which rests against the adapter collar. The other face slopes from a distance of ½ in. from the flat face to a distance of 1¾ in. It backs up the offset nipple during application to the hose.

The bench rests on a wood block on each end that is 4 in. by 5 in. by 28 in. To the top of the wood is attached ¾-in. plate bent to the shape of a large channel. The plate which forms the top of the bench, and to which the horizontal cylinders bolt, is welded to this vertical support. The vertical cylinder bolts to a channel ⅜ in. by 3 in. by 11 in. which is welded to the bench. The top of

the bench extends far enough to accommodate three boxes containing couplings, clamps and nipples.

The first step in dismantling all three types of connections and the final step in assembling steam-heat connections is performed on the second power device. This device grips the clamp of all hoses for removal of the clamp bolt. It grips and compresses the steam connection clamp to ease the job of removing the bolt.

The clamps are compressed or held by the force of a 6-in. air cylinder bolted to a plate 1¼ in. by 6 in. by 36 in. A clevis attached to the end of the piston rod is pinned to a ¾-in. plate 6 in. high. This is welded at the bottom to the center of a horizontal plate 2 in. wide that runs in a slot ½ in. deep milled in the plate to which the cylinder is bolted. The vertical and horizontal plate together form a crosshead. The slot is partially closed over by two plates ½ in. by 2 in. by 18 in. which bolt flush with the outside edges of the cylinder plate. The inside edges of the plates are 1 in. apart, which gives room for the vertical plate to move up and down and provides a top guide surface for the horizontal plate. One clamping jaw is attached to the crosshead and the other to the bench.

A pair of jaws each with a semi-circular opening in the contact end hold hose clamps for cutting the clamp bolt and compressing the steam-line clamp for removal of the bolt. Each jaw plate has two holes in which fits a member shaped similar to a sickle. Two bolts in the portion equivalent to the handle of the sickle fasten each of these members to the jaw plates. The end of the blade fits the hose clamp at the bend just below the clamp-bolt hole and compresses these ends together for insertion and tightening.

Roller-Bearing Mounting Press

The Union Pacific has constructed a press for mounting stock-car roller bearings and passenger-car roller bearings used on axles up to 5½ in. by 10 in. at the shops in Omaha, Neb. The press is complete with equipment for lifting, turning and holding a pair of wheels in place for mounting roller bearings. Adjustments to compensate for different-size wheel diameters and jacks for pressing the roller bearings in place are incorporated.

The bottom of the machine is made from two old scrap sections of rail spaced several inches apart. The wheels are rolled down the shop track and up an incline which is made by cutting a 3-ft. length of scrap rail to a taper. Each rail length is set on top of the shop track. After a pair of wheels is rolled up the incline, the wheels are positioned by dropping into the depression between the two sections of rail which comprise the main base of the press. Before mounting, the lateral is checked by assembling the inside and outside rollers, the spacer and the housing on an old axle with a water guard mounted. The axle is raised with a 25-ton air-motor-driven jack which fits under the center of the axle. The jack is carried on a four-wheel dolly which runs on the base rails. To the shaft is fitted a holder in which the axle rests while being lifted and held for application of the bearings.

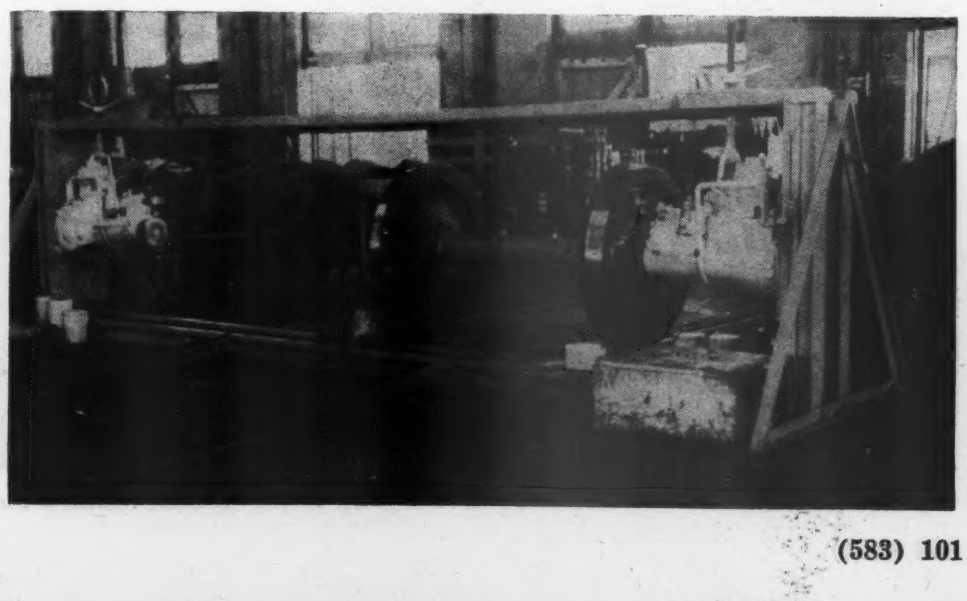
Each side of the press is made from two scrap sections of rail which form the main vertical support. The rails are reinforced and supported by three equal lengths of angle iron, 2 in. by 2 in., welded together to form a triangle. The main vertical members of each side are joined together across the top by two transverse parallel lengths of 2-in. by 2-in. angle welded at each end to the top of the vertical scrap rail sections. The 100-ton air-operated jacks which press the bearings on the journal are supported from the top of the transverse angle irons through ½-in. plates welded to the top of the angles. The support for each jack is adjustable up or down by a wing-nut.

The nut fits on the threaded end of a double-hook member shaped like an inverted Y. The threads are on the portion of the stem above the ½-in. plate. Turning the wing handles clockwise tends to tighten the nut on the stem, and, due to the restraining influence of the plate, raises the double-hook member. This lifts the jack to the desired height as the jack is carried in a suitably shaped sling made from 1-in. pipe that hooks into a right-angle bend on each of the arms of the Y. The jack is raised or lowered in a straight vertical motion and the shaft kept horizontal by the action of a 9/16-in. plate to which the base of the jack is welded. The plate has four U-clamps which slide over a ½-in. plate welded vertically to the main vertical rail supports.

Normally, roller bearings are pressed on by the jack shown on the right in the illustration. The other jack is used to back up the axle through a filler piece made of 4-in. round stock suspended by a chain from a bar that lies across the two top angle irons of the press. After the bearing assembly has been pressed in place on one journal, the mounting pressure is released, the backing-up stock swung clear, the axle raised for turning 180 deg., and the axle then lowered to the original height for mounting the second bearing.

A step-size journal is used in the stock-car roller-bearing program, in which 300 cars have been equipped with roller bearings and 500 more are undergoing conversion from plain bearings. The step-size journal permits the continuance in service of existing truck frames which are used in conjunction with scrap passenger-car wheels.

The Union Pacific's roller-bearing mounting press with a pair of wheels ready to be rolled into place for mounting the bearings



Shadow-Lined Passenger Cars

The Shadow-Lining of passenger-car exteriors to simulate fluted stainless-steel side sheathing was first given practical application on an Atchison, Topeka & Santa Fe lounge car No. 1361 at its Topeka, Kan., shops in June, 1947. Since that time, the process has been further improved until, with proper painting procedure, it takes exceptionally keen eyesight at a distance of 50 ft., or more, to tell the painted and shadow-lined flat car side from fluted, stainless steel construction.

The advantages of Shadow-Lining are apparent since both new and older passenger cars with flat sides painted by this method may be placed as desired in trains of stainless-steel cars without destroying the train effect. The Santa Fe is now completing a program of modernizing over 100 cars with this type of side finish and it is also being tried experimentally on other railroads.

Shadow-Line Painting

The process of Shadow Lining, as carried out on the Santa Fe is as follows:

Sandblast or shotblast the entire exterior of the car; roof, sides, ends and skirt. Care is taken to remove all black paint, car cement, grease, etc., as this material will bleed through the finish.

Apply a priming coat of paint—steel-car primer, 5 gal. per car. The drying time is 24 hr., minimum.

Apply a surfacing—steel-car surfacer reduced to a consistency for handling with a spray gun (surfacer required approximately 3½ gal. and 1½ gal. turpentine). The drying time is 12 hr., minimum.

Putty and knife-in steel-car surfacer as received from the manufacturer. No thinner is used. Where necessary, apply a second coat of surfacer with knife. The drying time is 12 hr., minimum.

Apply a second surfacing coat—steel-car surfacer reduced to a consistency for handling with a spray gun (surfacer requires approximately 3½ gal. of turpentine). The drying time is 12 hr., minimum.

Sandpaper the entire car with wet or dry No. 180 sandpaper until a smooth surface is obtained, using water with the sandpaper to obtain good results.

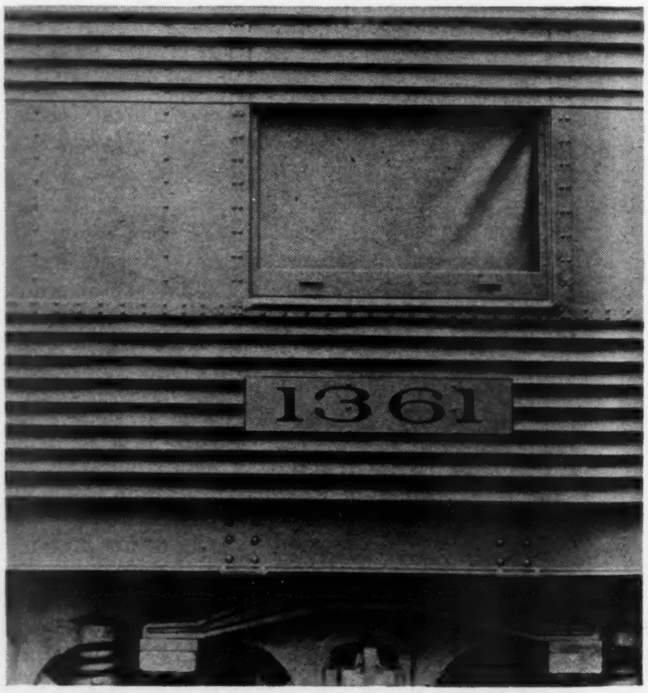
Applying the Aluminum Coating

Apply the first aluminum coating wet—Use 1¼ lb. of aluminum paste to 1 gal. of A-2424 aluminum vehicle. Reduce the above by adding one pint of No. 40 reducer. Apply to the roof, ends, sides and skirts. Approximately 25 gal. will be needed for two coats. Battery boxes and all underneath equipment projecting below the skirt are painted at the same time as the skirt.

Apply the second aluminum Mist Coat. The aluminum mixture is the same as the first coat, except for being reduced with 20 oz. of No. 40 reducer to 1 gal. of aluminum mixture. Caution: Application of the second coat must be started within 2½ hr. after the start of application of first coat.

Apply a clear coat (Light coat, mixed 2 parts S.S. clear finishing coat with 1 part A-2424 aluminum vehicle). Reduce the above by adding ¼ gal. of No. 40 reducer to each gallon of mixture, approximately 5 gal. being required for one coat. Caution:—The application of this clear coat must be made 2½ hr. after the last aluminum coat is applied. The drying time is a minimum of 48 hr. or more, depending upon humidity conditions.

Apply chalk lines to car sides to indicate the location of Shadow-Line painting after the aluminum paint is surface dry. Care is taken to see that the chalk line is straight, Santa Fe experience being that a 15-ft. length line will give desired results.



(2) Close-up showing how closely the Shadow Lining simulates fluted stainless steel construction

(1) Shadow lined Pullman Car on The Atcheson, Topeka, & Santa Fe

Apply a 1½-in. wide masking tape to the car sides with the bottom edge of one piece of tape on each chalk line. About 3,200 lineal ft. of masking tape will be needed per car. Eight hundred feet per car of 4-in. masking tape is required in addition to protect other surfaces of the car side from black Shadow-Line paint.

Apply the shading black to the car sides only. The shading black enamel is reduced by adding one part of No. 5 reducer and one part of S.S. clear finish to one part of shading black.

Additional reducer may be needed and a test can be made by spraying a piece of glass. If light is visible through the black paint, it is satisfactory for use. If light is not visible, additional thinner and S.S. clear should be added. Use a small lettering spray gun, holding the nozzle about 3 in. from the side of the car. Approximately 1 gal. of shading enamel black is required per car.

A clear finish coat may be applied immediately after the black Shadow-line painting is completed. The first finish coat, with medium thickness of film, consists of 1 gal. of S.S. clear finishing coat reduced with 20 oz. of No. 40 reducer. Approximately 6 gal. of material is required per coat. The second finishing coat is the same material as the first coat, applied to the entire car.

Trucks and underframe are thoroughly cleaned, all loose paint and scale being removed with wire brush or scraper and grease with benzine. The trucks receive two coats of aluminum paste mixed in No. A-2424 aluminum vehicle. No drying time is needed between coats.

The underframe from end sill to inside of body bolster receives two coats of aluminum paste mixed in No. A-2424 aluminum vehicle. It is not necessary to paint the entire underframe as only those parts which are visible from the outside of the car are painted.

The name Santa Fe on the letter board and the car number are lettered with Dupont's Dulux No. 95-7469, Item 2168, black lettering enamel over the aluminum coating. Two coats of black lettering paint are applied.

The second lettering coat is applied after the first coat has been applied to name and number plates.

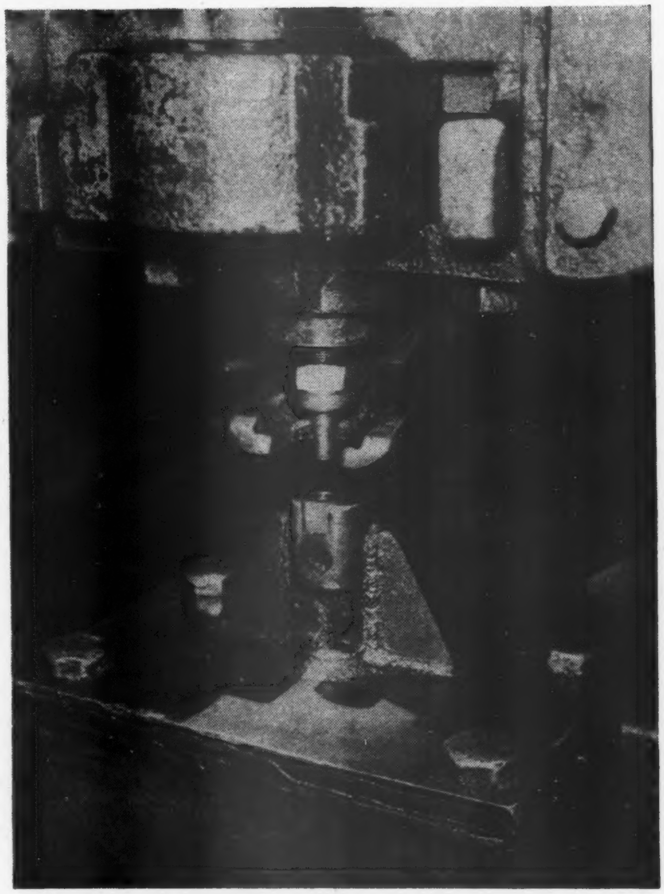
The name plates are lettered at the same time the car side is Shadow-Lined. A clear-finish coat is applied over the nameplate lettering.

The products designated by type or number in this article, except as specifically noted, are those marketed under the trade name of Murphy and are manufactured by the Interchemical Corporation, Newark, New Jersey, which manufacturer also developed the process as used by the Santa Fe.

Small Angle and Channel Hole Punch

The production of small angles and channels for freight car application requiring a series of small holes is speeded up at the Marshall, Tex., shops of the Texas & Pacific by a punch and die applied to a punch and shear. The punching arrangement will accommodate channels from 3 in. to 5 in. with a metal thickness from ⅛ in. to ⅜ in. Holes from ¼-in. to ¾-in. diameters may be punched, in steps of 1/16 in. with the center of the hole a minimum distance of ⅝ in. from the inside of the leg of a channel or an angle.

The holes are made with a series of appropriate sized punches that fit in the head of the machine. The die consists of a cylinder 3-in. outside diameter on which the two edges against which the legs of the channel or angle are placed are faced flat. An opening 1½ in. in diameter and 1 in. deep in the holding cylinder accommodates the different sized die inserts. The hole in the insert is 1/32 in. larger in diameter than the punch with which it mates.



Die for punching holes from ¼-in. to ¾-in. diameters in small angle and channel iron. Holes may be punched with the centers as close as ⅝-in. from the nearest perpendicular edge

The die holder is welded to a ¾-in. plate 6 in. high, 9 in. across the base and 4½ in. across the top. It is reinforced by another piece of ¾-in. plate welded to the machine base and to the die holder mounting.

* * *

Underside of modern passenger car showing electrical equipment

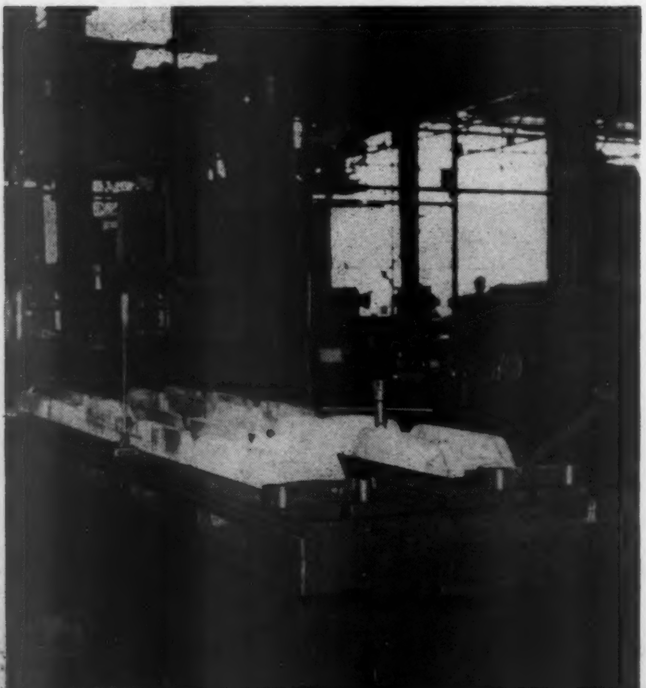
IN THE BACK SHOP AND ENGINEHOUSE

Holding Clamp Leaves Surfaces Free

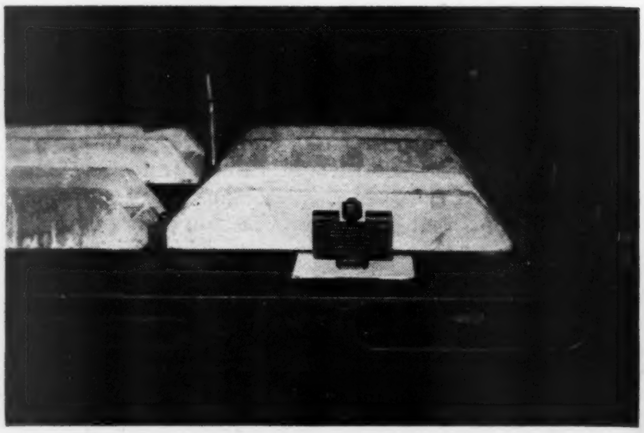
A holding clamp in use at the Texas & Pacific's Marshall, Tex., shops permits the machining of all but one surface of many locomotive parts with a single setup. Used for shoes and wedges, guides, binders, truck jaws, pedestals, crosshead gibs, etc., the clamp reduces the floor-to-floor time for machining and increases the accuracy of alignment of one surface with another. Both of these objectives are accomplished through the reduction of the total number of setups required for machining all surfaces. The clamp further permits the simultaneous machining of as many pieces as the machine bed will hold.

The overall dimensions of the clamp are made to suit the size work pieces they will be used to hold. They are norrower and not quite as high as the piece to be machined. The clamp is held to the machine bed by a ⅝-in. bolt with the head formed to fit the T-slot. The bolt fits through an 11/16-in. hole, and the clamp is tightened to the bench with a nut on the threaded end. The clamp is held in alignment by a tongue on the bottom which is made 1/32 in. narower than the T-slot. To permit the nut to be tightened with a socket wrench and to avoid any projection above the top of the clamp, a slot 1¾ in. square and ¾ in. deep is cut through the center of the clamp. Teeth are cut horizontally on the holding edges of the clamp to hold the work more firmly. There are eight teeth to the inch, each cut with a horizontal base and a 60-deg. slope to provide maximum gripping action.

To set up from one to as many work pieces as the machine bed will accommodate, as many clamps as will be needed (one more than the number of work pieces in each row) are placed in the T-slots at intervals approximately the length of the work piece. The work pieces are placed on the table with a clamp on each end of the row and one between each two work pieces.



Ten shoes being held in place by multiple clamps for simultaneous machining with a single setup for all but the bottom surface—The shoes are aligned with the surface gauge shown on the left and tightened in place with the wrench on the right



How the multiple clamps hold the shoes in place without interfering with the machining of the surfaces—In the foreground is a clamp resting on the machine bed showing the bolt head that fits in the bed T-slot and the slot in the top of the clamp for tightening the nut which secures it in place

After the work pieces are aligned with a surface gauge, a pressure bar at one end of the row tightens the pieces end to end. The pressure bar is a piece of stock 10½ in. by 1½ in. by 2¼ in. with a ⅞-in. bolt through it that acts as a set screw. The back of the pressure bar rests against two shouldered cylinders. The top part of these cylinders is 1½ in. in diameter and the bottom turned to a size that will fit freely but snugly in holes in the machine bed. The front face of the pressure bar is against the clamp at the end of the row. Turning the set screw in the pressure bar forces the work pieces in the row tightly together. Each work piece is then tapped down with a soft hammer and secured in place by tightening the clamps. In most objects, all but the bottom surface can be machined with the one setup.

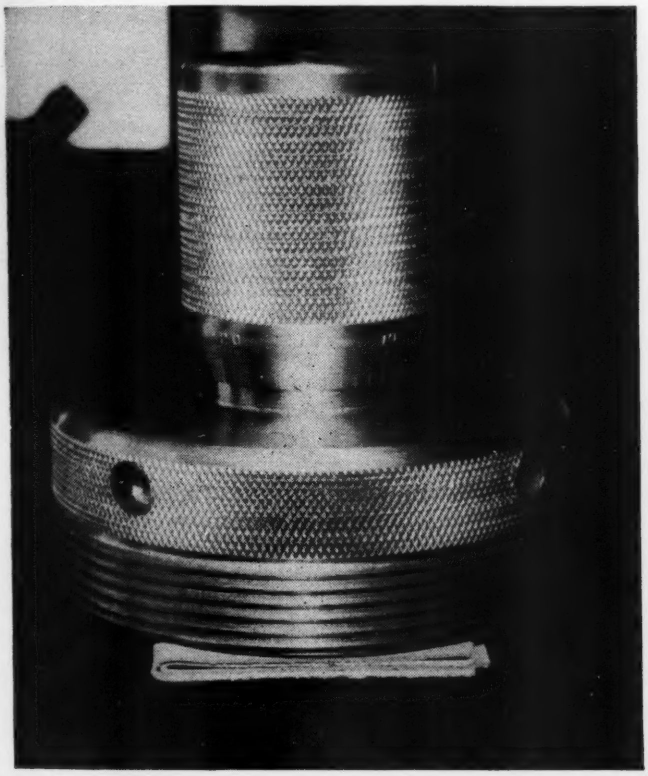
This clamping arrangement is known as the Barnes Multiple clamp and is patented by Edward Barnes, 1101 Goodwin street, Marshall, Tex.

Micrometer for Setting Diesel Pinions

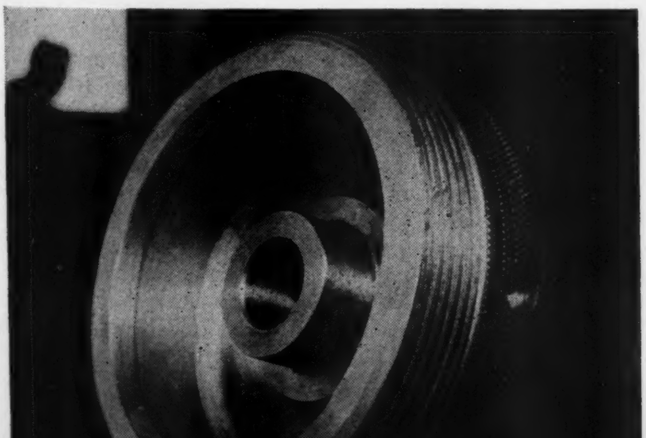
A micrometer gauge in use at the Pine Bluff, Ark., shops of the St. Louis-Southwestern eliminates the possibility of slipping the heated Diesel locomotive traction-motor pinion too far on the pinion shaft. The pinion micrometer consists functionally of two parts, a collar and a shaft. The collar is threaded on the outside—8 Acme threads per in.—for screwing into the recess shoulder of Electric-Motive freight-locomotive pinions and is bored out hollow; it has 1½-in. internal threads, 20 per in., into which screws a graduated shaft of typical micrometer-shaft design.

The pinion is slipped cold over the taper fit of the

shaft, and the micrometer screwed into the internally threaded pinion recess. A reading is then taken on the micrometer shaft. The shaft is retracted .055 in., the amount of draw given this class of pinion, and the pinion heated to the application temperature. The heated pinion is placed on the shaft and is automatically fitted in the correct position by the stop created when the micrometer shaft comes into contact with the bottom of the pinion recess. All possibility of positioning the pinion too far on the shaft is eliminated with this positive stop provided by the micrometer shaft.



The pinion micrometer, showing the external thread on the collar by which the micrometer screws into the pinion recess—The pinion shaft provides the positive stop by contact with the bottom of the recess

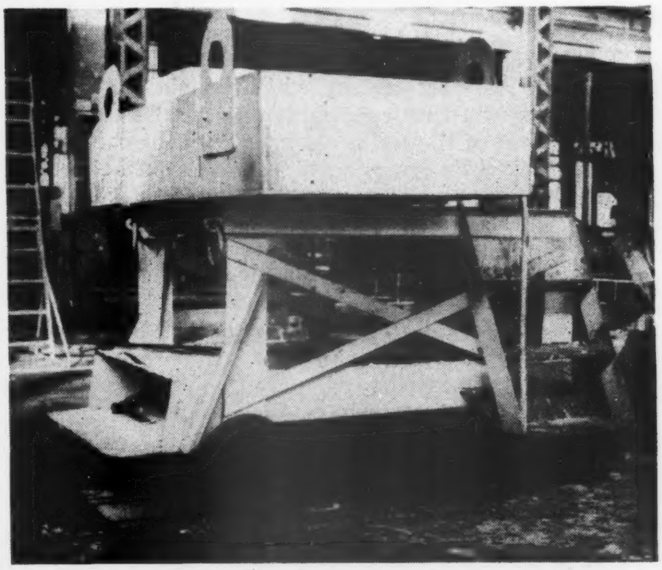


The shaft of the pinion micrometer is of conventional micrometer-shaft design and graduated in thousandths

Fire Clay and Brick Holder

Maximum convenience of supplies is afforded for rebricking fireboxes by a container with two separate tubs that hold fire clay and brick and are handled either jointly or separately with the shop crane. Designed and built by shop personnel at the Parsons, Kan., shops of the Missouri-Kansas-Texas, the device serves not only as a well-located source of brick and clay to the boilermakers, but two sets of steps provide all workers with a safe and easy access to the locomotive cab. For longitudinal shops it has the added advantage of being mounted on wheels and securely fastened to the locomotive; hence it is able to move with the locomotive without interrupting progress of the work.

The firebox-bricking-material container is of all-welded construction and made entirely from 1/4-in. scrap tank sides with the exception of the non-skid metal used for the steps. The fire-clay tub is located at the bottom and is 50 in. wide by 7 1/2 ft. long by 12 in. deep. The pan for the firebrick rests on the top of the fire-clay tub and is a separate piece from the fire-clay tub. It is 52 in. wide by 8 1/2 ft. long by 18 in. deep. The brick pan has its own set of four lifting ears 14 in. wide with a 6-in. hole, and may be carried either separately or integrally

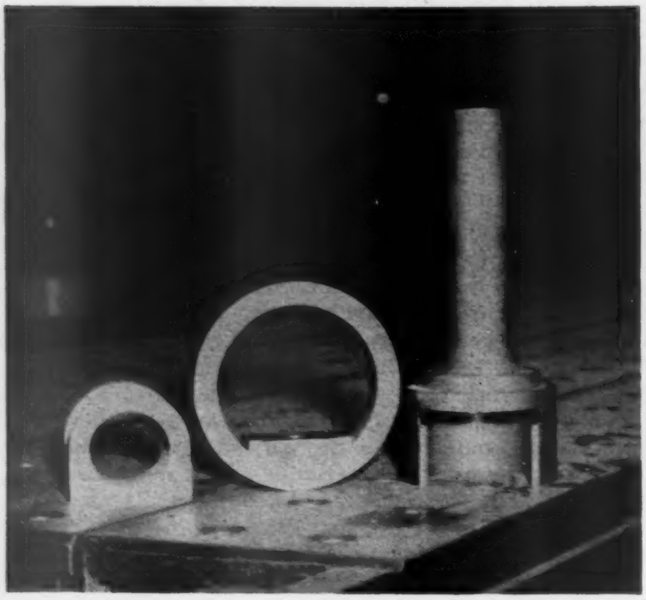


Container for fire clay and brick provides both a convenient storage for rebricking materials and a handy access to the locomotive cab

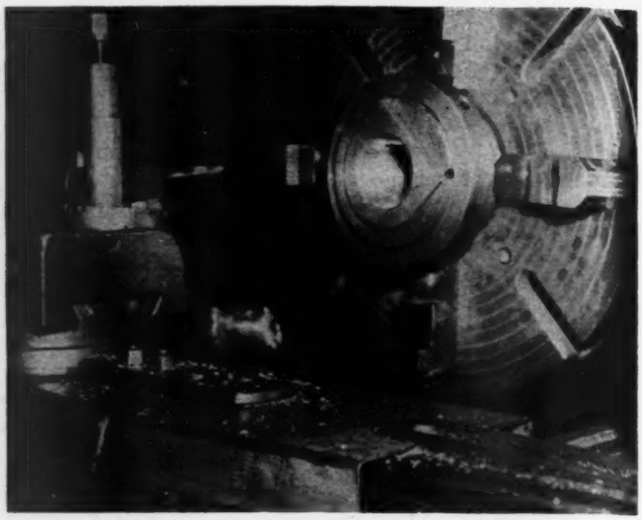
with the rest of the container by the overhead crane. The deck which provides access to the locomotive cab is 56 in. above the top of the rail. It is reached by three steps 28 in. wide spaced 14 in. apart vertically. The entire unit is mounted on a set of four wheels discarded from a track-gang motor car.

Stoker-Engine Rod Bearing Jig

A jig has been built at the Springfield, Mo., shops of the St. Louis-San Francisco for holding the two halves of stoker-engine rod bearings together to machine the inside bearing diameter. The jig has two parts, a stud arbor and a brass ring, suitably shaped to hold both the semicircular half and the rectangular-shaped half of the bearing in the proper location with respect to the cutting tool so that the finished bore will be concentric with



Jig for boring stoker engine rod bearings—From left to right are the bearing, the brass ring with its locking segment in place, and the arbor piece in which the assembly fits



A stoker bearing mounted in the holding jig for boring the inside diameter showing how the brass ring holds the bearing in place on the arbor through the locking segment

the external semi-circumference of the bearing surface.

The large end of the arbor has a U-shaped cavity to receive the two-part bearing which is held in the arbor by applying the ring and tightening a set screw. The outer contour of the end is circular, with the continuous surface broken by removing a section of metal the size of which is the length of the rectangular part of the bearing. The bearing fits this piece with .003 in. clearance.

The two halves of the bearing are held together and in place on the arbor by the brass ring, which fits over the arbor and which is in two parts: the ring proper and a locking piece. The latter is shaped like a segment of a circle and is attached to the inside circumference of the ring by a set screw. The bearing is inserted in the brass ring by loosening the set screw. It is secured in place by tightening the set screw, which clamps the flat side of the locking segment against the flat portion of the stoker rod bearing.

Questions and Answers on Locomotive Practice

By George M. Davies

(This column will answer the questions of our readers on any phase of locomotive construction, shop repairs, or terminal handling, except those pertaining to the boiler. Questions should bear the name and address of the writer, whose identity will not be disclosed without permission to do so.)

Exhaust Steam Injectors

Q.—How does an exhaust steam injector work? Several have been applied to our 2-8-4 locomotives. Is an exhaust steam injector equivalent to a feedwater heater application? —R.V.K.

A.—The exhaust steam injector is based on the injector principle and was designed for the purpose of feeding the boiler with hot water, utilizing the heat and energy of the exhaust steam from the cylinders of a locomotive and thereby obtaining an economy by the use of a waste product. The exhaust steam injector consists of a heater, containing two sets of tubes, a heating or low-pressure set operated with exhaust steam which delivers hot water under pressure to a second or forcing set of tubes using live steam from the boiler.

The amount of heat in exhaust steam is large in proportion to steam at higher pressure and it is this latent heat which is applied usefully to heat and force a strong jet of water into the second set of nozzles. The amount of exhaust steam that can be used by the heater is fixed by the feedwater temperature limit of the forcing set of tubes, the colder the water in the tank the greater the proportion of exhaust steam that may be used and the higher the relative efficiency of the apparatus. The temperature rise due to the exahust steam should result in a delivery temperature from the heating tubes alone of from 150 to 185 deg. F. depending upon the exhaust pressure, its superheat and the general operating conditions. The forcing set further increases the temperature of the water, the feedwater entering the boiler at a temperature of from 260 to 300 deg. F. or not far below that of saturated steam at boiler pressure.

The manufacturers claim that the heat returned results in a saving of fuel of 8 to 12 per cent throughout the range of operating conditions. The saving in water due to condensation of exhaust steam returned to the boiler is approximately the same. In calculating maximum evaporative capacity of a boiler add 8 per cent for locomotives having exhaust steam injectors.

Applying Grease Fittings

Q.—When applying grease fittings to the main and side rods what provisions are made to comply with the rule which states that oil and grease cups shall be securely attached to rods, and grease-cup plugs shall be equipped with suitable fastenings.—A.L.M.

A.—There are various methods for securing main- and side-rod grease plugs such as doweling the plug into the rod after the plug has been screwed in, applying a lock washer on the same threads that screw the plug into the rod, spot welding the grease plug to the top of the rod, and securing the plug bushing to the rod with

a set screw through the side of the rod. Also, an adapter suitable for use with a grease fitting may be applied to the rod grease cup. It is prevented from coming out by use of a lock, which consists of a ⅛-in. plate, one side of which is bent down to the rod, the other side is turned up on the adapter bushing. The fitting is secured to the adapter by spot welding. This method eliminates the undesirable feature of welding to the rod.

Locomotive Boiler Questions and Answers

By George M. Davies

(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Visual Welding Defects

Q.—What welding defects can be found by an inspector as a result of the visual examination?—I.J.R.

A.—The welding defects to be found by visual examination would include undercutting, excessive reinforcement of the weld, insufficient weld metal, overlapping, oxidized metal, poor penetration, adhesions, unequal legs on fillet welds, convexity at the edge of a weld bead, and poor fit-up. Most of these defects are indicated by the shape or contour of the weld deposit.

Evaporation Values of Boiler Tubes and Flues

Q.—Is it correct to allow the full value of heating surface throughout the full length of the boiler tubes and flues? Would it not be more correct to take the full value for about eight to ten feet, then about 50 per cent for the next five feet and the remainder about 25 per cent?—A.L.M.

A.—Evaporation tables for tubes and flues give the evaporation in pounds of steam per hr. per sq. ft. of outside surface. The evaporation tables are generally equated from a base figure of ten pounds of water per hr. pr. sq. ft. of heating surface of 2¼-in. tubes, 18 ft. long. The length of the tube definitely affects the evaporation value although not in the proportions outlined in the question. For the purpose of calculation a table of average evaporation values compiled from various formulas and Pennsylvania test plant data is given in The Steam Locomotive by R. P. Johnson, published by the Simmons-Boardman Publishing Corp., 30 Church st., New York.

Staybolts of High-Strength Steel

Q.—What effect would the use of high-tensile staybolt material in firebox side sheets have on the tightness of the staybolts? Would leaky staybolts result from such a combination?—R.E.L.

A.—Leaky staybolts could easily result from such a combination. The strength and the elastic properties of the staybolt and sheet material must be considered. The sheet should have a higher elastic strength than the staybolt in order to grip the threads properly. However, good service can be obtained with sheets of slightly lower physical properties than staybolts if all engaging threads are under compression. The yield point of the firebox sheet should not be less than the yield point of the staybolts.

Overheated Side Sheets

Q.—We recently had an overheated firebox side sheet the cause of which was given as the lack of water circulation. How would the lack of circulation cause a firebox sheet to overheat as long as there is water in the leg of the firebox? —R.E.V.

A.—The velocity of the circulation of the water is definitely a factor in the overheating of firebox side sheets. If the action or motion of the water circulation is insufficient to remove the steam bubbles as fast as they form on the water side of the sheet, the layer of steam will act as an insulating blanket that reduces the rate at which heat is absorbed from the firebox sheet. The quantity of heat which can be transmitted is limited only by the rate at which the convention currents of the water will carry it away from the heating surface. If a lag or dead circulation spot occurs, overheating of the firebox sheet generally results.

Air Brake Questions and Answers

The 24 RL Brake Equipment for Diesel-Electric Locomotives—Parts of the Equipment— Locomotive A Unit

718—*Q.—What effect does this have on the piston?* A.—A pressure differential is created across the piston *7* due to the choke in the piston stem between chambers *B* and *C* so that the piston is moved downward unseating valve *11* and permitting main reservoir air to flow from chambers *A* to chamber *F* and delivery passage *21* as previously described.

Automatic Brake Valve Operation Release and Charging

719—*Q.—What precaution must be observed during charging?* A.—Either the DS-24 brake valve handle or the foot pedal must be held down.

720—*Q.—With the air compressors cut in and operating where does the air flow to?* A.—To the first main reservoir, thence through the connecting pipe and check valve to the second main reservoir.

721—*Q.—Are the main reservoirs connected between the units?* A.—A branch pipe from the reservoir connecting pipe is connected between units, and equalizes main-reservoir pressure on the units.

722—*Q.—What protection is afforded in the event*

of main-reservoir pipe breakage between the units? A.—The main-reservoir cut-off valve in the branch pipe protects against loss of main-reservoir air in case of a break in the main-reservoir pipe between the units.

723—*Q.—To where does the air flow from the second main reservoir?* A.—From the second main reservoir through the *H* filter to three branches.

724—*Q.—Describe the flow to the first branch.* A.—To connection *30* of the *S-40-D* independent brake valve and connection *30* of the *DS-24* brake valve.

725—*Q.—Describe the flow to the second branch.* A.—To an *I* check valve and the third main reservoir from which the air flows through a *J* filter to connection *6* of the *D-24* control valve, connection *MR* of the *B3* relay valve and connection *30* of the *k2* Rotair valve.

726—*Q.—Describe the flow to the third branch.* A.—To the *M3* reducing valve, where the air is reduced to the reducing-valve setting and flows through the *C-I-3-6* strainer and check valve to the signal pipe.

727—*Q.—At the* S-40-D *Independent brake valve, what branches lead from connection* 30? A.—Two branches, one of which leads to inlet valve *50-Plate B.*

Diesel Locomotive Questions and Answers

By J. R. Benedict

Lubricating Oil System—G. M. Engines

The following discussion includes pertinent facts, questions and answers concerning the lubricating oil system of General Motors type 567 twelve- and sixteen-cylinder engines used in road locomotives. The purpose of the lubricating oil system is twofold; one, to provide lubrication for all moving parts, the other, to serve as a cooling agent for these moving parts. There are approximately 110 gal. of oil in the 12-cylinder, 1,000-hp. engine; 180 gal. in the 16-cylinder, 1,350-hp. engine and 200 gal. in the 16-cylinder, 1,500-hp. engine. Approximately ten to twelve per cent of this volume of oil is used for lubrication, the remainder is used to cool the engine parts.

The lubricating system is divided into external and internal systems. The purpose of the external system is to provide for cooling and cleaning the oil.

In the external system of FT and F3 freight locomotives the oil is drawn by suction from the engine oil sump through scavenging strainers (one on 567B engines. three on 567A engines) to the scavenging pump, which has a 234 gal. per min. capacity on the 16-cylinder engine, and then discharged under pressure into the four-element filter tank, which has five, 16 to 19-lb. relief valves located in the tank base, that by-pass approximately 74 to 77 per cent of the oil around the filters. Oil leaving the filter tank flows through the oil cooler and thence through two wire-screen, pressure-pump suction strainers.

In the E6 and E7 passenger locomotive the oil is drawn by suction from the engine oil sump through scavenging strainers (three screens on 567A engines and an oil sump screen on 567 engines) to the scavenging pump, which has a 170 gal. per min. capacity on 12-cylinder engines, and then discharged under pressure into the oil cooler assembly. On 567 engines a 50-lb. relief valve is in parallel with it; on 567A engines the 50-lb. relief valve is located at the filter tank. Leaving the oil cooler assembly, oil passes through four tubes which contain filtering elements. The spring-loaded tube caps act as relief valves and relieve at approximately 22-lb. pressure. Oil leaving the filter elements flows through two wire-screen pressure-pump suction strainers.

In the internal system for the main bearing the oil leaving the main-bearing pressure pump, which has a capacity of 86 gal. per min. for 12-cylinder, 1,000-hp. engines, 117 gal. per min., for 16-cylinder, 1,350-hp. engines and 140 gal. per min. for 16-cylinder, 1,500-hp. engines, flows past a 50-lb. relief valve, through an inverted-Vee manifold, into a triangular-shaped manifold which runs the entire length of the engine. At each main bearing a pipe, standing at a height of 2½ in. in the triangular-shaped manifold carries oil through the A frame to the main bearing and thence through a drilled passage in the crankshaft to the connecting-rod bearings. Oil leaving the rear end of the triangular-shaped manifold provides lubrication for two idler gears (on 567A engines, three flexible pipes are used at this point), cam-shaft drive gears, blower-drive gears and blower and through external connections provides a source of oil to the low-oil pressure switch and main-bearing pressure gauge. Oil leaving the cam-shaft drive gears flows through the hollow cam shaft and provides lubrication for the cam shaft-bearings, rocker-arm pins, rocker-arm roller-cam followers and injector follower housings, exhaust valve stems, through valve bridge assemblies to hydraulic lash adjusters; and overspeed mechanism.

For piston cooling the oil leaving the piston-cooling pressure pump, which has a capacity of 43 gal. per min. for 12-cylinder, 1,000-hp. engines and 59 gal. per min. for 16-cylinder, 1,350- and 1,500-hp. engines, flows through two piston-cooling manifolds (one on each bank of cylinders), through piston cooling pipes. This oil provides for cooling of piston skirt crown, lubrication of .060 in. piston thrust washer, lubrication of piston pin and its bushing, and through 64 holes in piston skirt it lubricates the cylinder walls.

The major trouble experienced throughout the lubricating oil system is an insufficient volume of oil being circulated to the moving parts. This condition is usually indicated by a lowering of lubricating oil pressure at the various system gauges.

Q.—What would cause the main bearing pressure to drop below normal?

A.—If the main-bearing gauge pressure drops below normal, the trouble may be in one or more of the following items: (1)—Dirty and improper seating of pressure-pump suction screens and scavenging-pump suction screens; (2)—dirty or stuck-open 50-lb. relief valve; (3)—diluted or emulsified oil; (4)—defective gauges; (5)—insufficient quantity of oil in system and (6)—defective Diesel engine parts or high water temperature.

Q.—How does a dirty or stuck-open relief valve affect the oil pressure? What should be done about it?

A.—A dirty or stuck-open 50-lb. relief valve will permit oil leaving the main-bearing pressure pump to by-pass the main-bearing system directly to the engine sump. Remove and clean same. Care must be taken that the valve seat is in good mechanical condition before reinstallation.

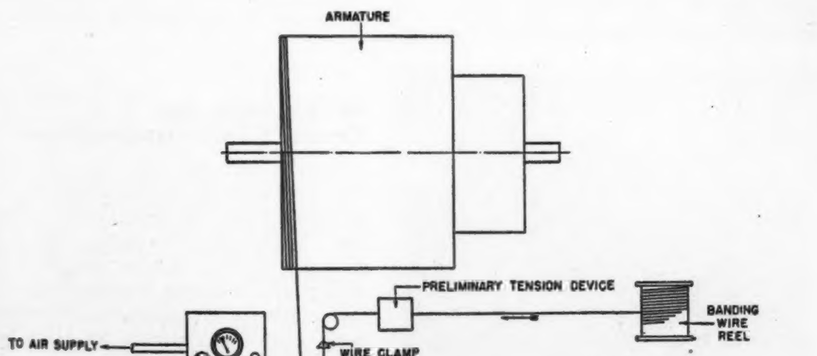
ELECTRICAL NEW DEVICES

Rolling Band Tension Device

A rolling band tension device developed by the Electric Service Manufacturing Company, 1739 Cambria street, Philadelphia 32, Pa., can be used as part of the Universal armature machine and HL banding lathe, as an attachment for the company's machines which are now in the field, or as an installation on standard engine lathes. The device will mount as a unit on a carriage, and has all the controls necessary for operation grouped in one locality. It requires only connections with compressed air and 110-volt, a.c. current.

Referring to the schematic illustration, the band wire is pulled from the wire reel, passed through the preliminary tension device, threaded around the various sheaves shown in the diagram, and then fastened to the armature at the left side by means of a mechanical band clamp. The preliminary tension device is adjusted, the band lathe started, and the band wire is wound on the armature until the entire core of the armature is covered. When the desired amount of wire has been wound on the armature, the machine is stopped, and the wire clamp on the carriage tightened sufficiently to hold the preliminary tension. The wire is then cut with enough slack so that it can be removed from the preliminary device and fastened by means of another band wire clamp to the bottom of the armature at the right hand end. The machine is started rotating in the opposite direction, and with the application of air to the pneumatic ram, the ram travels forward, thus taking up the slack in the band wire which has been created by the coils being forced down into the slot under pressure of the band wire. Several repetitions of this cycle with more air applied on each reversal properly sets the coils in the slots.

The air is controlled by a pressure regulator and a gauge so calibrated that the pull on the wire is indicated in pounds. An electrically operated solenoid valve is also supplied as a control for the pneumatic ram.



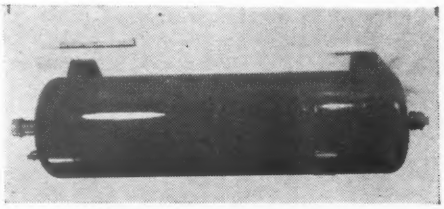
Schematic diagram of rolling band tension device applicable to a variety of armature machines and engine lathes

Oil Conditioner for Transformers

A thermosiphon oil conditioner with no moving parts, that absorbs moisture, acid, and sludge from transformer oil continuously while the transformer is in operation is announced by Westinghouse Electric Corporation. Units mounted on old or new transformers maintain properties of transformer oil or Inerteen essentially the same as those of new transformer liquid dielectrics for as long as the absorbent material remains effective. When after several years, the yearly inspection tests show oil deterioration, replacing the conditioner is all that is necessary. The conditioner is manufactured for Westinghouse by the Honan-Crane Corporation, of Lebanon, Ind.

Trial installations over a four-year period have shown that the conditioner holds neutralization number, power factor, dielectric strength, and interfacial tension to proper values for good operating practice with no other reconditioning necessary. Oil should test satisfactorily when the conditioner is installed.

The conditioning agent is held within an all-welded steel tank, dome shaped at both ends, about four feet long and twelve inches in diameter, weighing 167



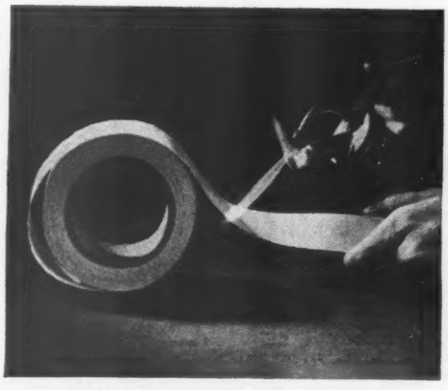
The thermosiphon transformer oil conditioner becomes part of the transformer to keep the oil continuously in good condition

lb. without oil. The conditioning agent is in $\frac{1}{4}$- to $\frac{1}{2}$-in. granules providing abundant surface of contact and assuring ready passage of the oil.

From one to four thermosiphon oil conditioners are required depending on the number of gallons of oil in the transformer and its design. On old transformers, the conditioners are mounted with a pipe support to the ground. Oil connections are made to the top filter-press connection and to either the bottom filter-press connection or to the main drain.

Inorganic Electrical Insulation

A completely inorganic electrical insulation having an asbestos base has been announced by Johns-Manville, New York. Known as "Quinterra," it re-



At red heat the insulation will not ignite, melt or char

sembles paper and is furnished in long lengths in roll or tape form.

It is of closed structure, and does not have holes or interstices. It has resistance to high temperature and it can be produced in thicknesses varying from 1.5 mil to 20 mils.

Sheets of Quinterra can be brought to bright red heat without igniting or melting. Even at 800 deg. C., it retains a dielectric strength of about 100 v.p.m. At room temperature, its minimum dielectric strength is approximately 250 v.p.m. This value increases with con-

tinued exposure to temperature and becomes about 400 v.p.m. at 300 deg. C. It is also a good conductor of heat.

Quinterra will be shipped in 50- and 100-lb. rolls or Jumbo rolls 36 in. wide. It will also be supplied in tape rolls in widths of ¼ in. and greater.

Portable Leak Detector

A portable leak detector especially designed for production testing of hermetically sealed units such as are used in refrigerators and air conditioners in which a halogen compound such as Freon is the refrigerant, has been announced by the Special Products Division of the General Electric Company. Other applications of this instrument include locating leaks in tanks, boilers, piping, and other closed systems into which halogen compounds can be introduced as a tracer.

The Type H portable leak detector as used in the field

The new instrument can detect a leak so small that it will release only 1/100 of an ounce of Freon in one year. It can inspect in a few seconds an ordinary joint or seam for leaks and, in addition, is desirable for service testing in the field as well as for assembly line use. The detector unit weighs 3 lb. and the control unit 15 lb.

The detector is a hand-held probe with a pistol grip, having a metal nozzle with a plastic tip. The unit contains a sensitive element which is responsive to halogens in the air, and a motor-driven blower which circulates the air through the sensitive element. An 8-ft. cable lead is supplied to connect the detector to the control.

The control unit contains the power supply, amplifier, indicating instrument and necessary controls. A 25-ft. lead is supplied for connecting the control unit to a source of 115-volt, 60-cycle, a. c. power.

If the unit to be tested does not already contain halogens or a halogen compound, a halogen is introduced as a tracer gas. The nozzle of the probe is then held about ½ in. from the surface of the unit being tested, and is moved about at the rate of about ½ in. per second. As the nozzle passes over a leak, halogen vapor is drawn in, and as this vapor reaches the sensitive element, an increase in current is indicated on a milliammeter.

Provision is made on the control unit for using earphones or a loudspeaker to indicate leaks, in which case the indication will be an audible note with the pitch depending upon the size of the leak.

Magnaflux Time Cut By New Magnetization Principle

An entirely new method of magnetizing parts in several directions at the same time will be employed in a new line of Magnaflux Duovec inspection units made by the Magnaflux Corporation, 5900 Northwest Highway, Chicago. This method permits parts to be inspected for defects in any direction with one magnetizing operation and one visual inspection operation instead of the usual two or more magnetizations and inspections which have been required in the past. The Duovec system comprises the application of two magnetizing forces simultaneously. The parts are placed between the heads on the unit, where they receive magnetization in both directions during one shot while the inspection bath is being applied.

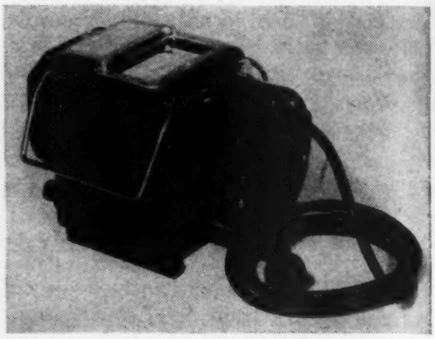
The Type MV is one typical unit of the Magnaflux Duovec type. In the MV unit, a current is passed through the part as in normal circular magnetization. At the same time the part is subjected to a longitudinal field of regularly changing strength. The resultant varying magnetizing force swings through an angle within the piece of considerably more than 90 deg. and thus cuts across all defects at right angles, as is required for best adherence of magnetic particles to form visible indications of the defects.

In these units the swing of the field may be adjusted from 0 deg. swing to well over 90 deg. by changing the relation of values between the circular and longitudinal magnetizing fields. This type of magnetization is used with the fluorescent Magnaglo particles as well as the usual wet Magnaflux visible particles to obtain indications of defects in the parts. Inspection with the Magnaflux Duovec is at present most applicable to the smaller parts which are substantially uniform in cross-section and are of essentially cylindrical or bar shape.

The type MV Magnaflux Duovec with swinging-field magnetization

Plug-In Insulation Tester

For those who need or prefer a Megger insulation tester that can be plugged in instead of hand-cranked, the James G. Biddle Company, Philadelphia, Pa., has developed a rectifier-operated instrument.



Rectifier-operated Megger insulation tester

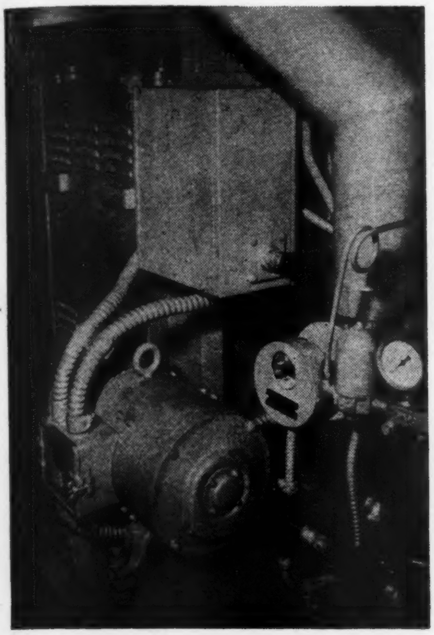
The instrument is especially useful where a large number of tests are to be made at one time, and also where an individual test is continued for many minutes.

It is essentially a modification of the company's U.S.-made "Meg" type insulation tester. The hand generator is replaced by a "power pack" consisting of a constant-potential step-up transformer and selenium rectifier, giving a constant d.c. test voltage. It is independent of the supply voltage. A switch, pilot light and connecting cable are included. The instrument is available in several voltages and ranges as follows: 0 to 100 and 0 to 100 megohms at 500 volts, 0 to 1,000 megohms at 400 volts, and 0 to 2,000 megohms at 2,000 volts.

M. G. Sets for Train Communications

Motor generator sets for converting one d.c. voltage to another are being furnished by The Safety Car Heating and Lighting Company, Inc., New Haven, Conn., to the Union Switch & Signal Company for use in conjunction with its installations of inductive train communications on Diesel-electric locomotives.

The motor-generator set converts from 64 volts d.c. to 32 volts d.c. at a rated output of 1,500 watts and operates at 3,900 r.p.m. It is equipped with inherent voltage regulation which maintains the output voltage within



A motor-generator set which supplies 32 volts for train communication installed in a Diesel-electric locomotive

plus or minus 5 per cent of rated values under all conditions of load and input voltages of 56 to 76 volts. Under ordinary conditions, closer regulation is maintained. Class B insulation is used throughout which permits operation at higher ambient temperatures.

The motor and generator are combined in a single frame. A terminal box of liberal proportions provides access to both the motor and generator terminals and houses the control equipment.

Both the motor and the generator armatures are mounted on the same shaft which is carried on sealed bearings packed with the correct amount of proper lubrication sufficient for several years operation. The seal is highly effective in retaining the lubricant and excluding dirt and foreign matter.

A step starter is ordinarily furnished with the set to limit the starting current to a comparatively small value, thus protecting the battery from rapid discharge when starting the set.

Lubricant for Anti-Friction Bearings

Tests recently completed with a grease known as Andok Lubricant B, made by Esso Standard Oil Company, New York, N.Y., showed several advantages in lubricating railroad anti-friction car journal bearings and electric-traction motor armature bearings. For both services, it was demonstrated that the new lubricant satisfactorily performed all normally required lubricating functions from overhaul to overhaul without intermediate replenishing or maintenance.

The lubricant is characterized by high oxidation resistance, absence of soap-separation, and resistance to thinning at high temperature which affords protection against leakage. All of these qualities serve to make the lubricant suitable for lubricated-for-life bearings and for application where the lubricant must serve between overhaul periods.

Tests made on Diesel-electric locomotive anti-friction traction-motor bearings showed the lubricant to be in good condition after 230,000 miles of service. In the case of anti-friction car journal-bearing tests, it served satisfactorily for 150,000 miles, when the car wheels were removed for turning.

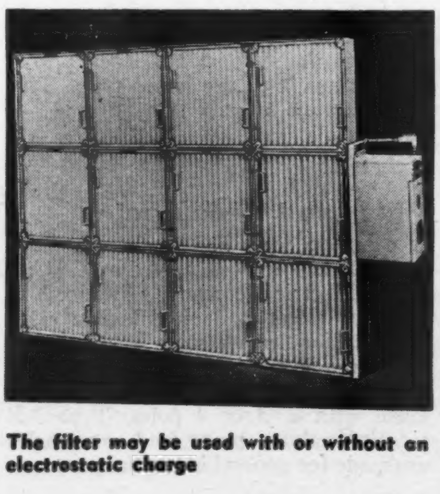
Electronic Air Filter

An electronic air filter, the Electro-PL, has been developed by American Air Filter Co., Inc., Louisville, Ky., with an intermediate cleaning efficiency for applications where the efficiency of a mechanical filter is too low and that of an electronic precipitator is unnecessarily high. The new filter is basically an electronic precipitator without an ionizing unit and contains a collector element of electrostatically charged Airmat paper.

This paper is a laminated cellulose product composed of a number of plies of porous, tissue-like sheets formed of short fibers in jack-straw arrangement and is also used as a filtering medium in mechanical filters. When an electrostatic charge is applied to the paper, the plies tend to separate and each individual fiber becomes a collecting electrode which attracts and holds dust and smoke particles. This action practically doubles the cleaning efficiency of Airmat paper.

Since the Electro-PL will continue to function as an efficient air filter when deenergized, its operation may be varied to suit the dust condition,—as an electronic air cleaner during the winter months when a smoky atmosphere is prevalent and as a dry-type air filter during the summer months.

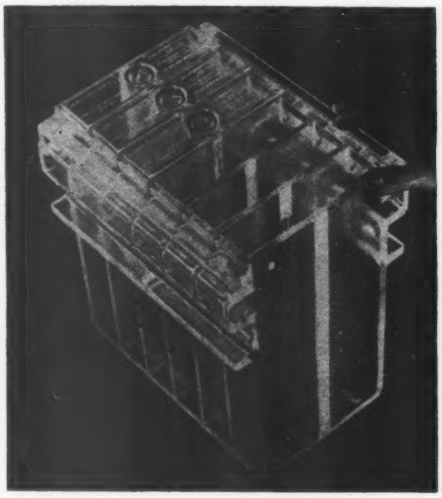
The elimination of the ionizer reduces the first cost of the filter below that of an electronic precipitator and also results in lowered power consumption. Maintenance is also simplified since the low-cost Airmat paper is replaced with new material when it accumulates its full dust load.



The filter may be used with or without an electrostatic charge

Plastic Battery Case

An Exide storage battery, made with a plastic case and manufactured by The Electric Storage Battery Company, Philadelphia, Pa., won first award in the Industrial & Machinery Classification in the 7th Modern Plastics Competition sponsored by Modern Plastics Magazine.



Plastic case for a 24-volt engine-starting battery

Transparent polystyrene plastic was used as the container material for the battery. The battery is rated at 24 volts, and is capable of producing 15 hp. for 3 minutes. The container permits a ratio of power to cubic content and weight greater than heretofore possible.

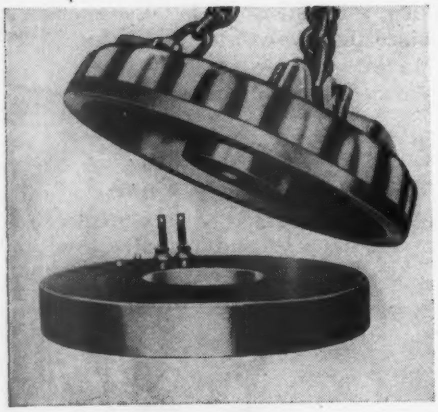
It has connections for venting gas automatically on charge and discharge, a no-overflow device to prevent over-filling, and complete filling and operating instructions which are molded into the plastic.

The materials are supplied by Dow Chemical Co., Bakelite Corp., and Monsanto Chemical Co. Molds were made by Special Machine & Tool Co., and the battery case was molded by Prolon Plastics Division of Pro-phy-lac-tic Brush Co.

Moisture-Proof Lifting Magnet

Lifting magnets made by Cutler-Hammer, Inc., Milwaukee, Wis., now incorporate a capsule coil construction. The magnet coil is incased in an all-metal, welded capsule from which all moisture is removed by a vacuum process before the coil is impregnated with insulating compound under pressure. The coil winding is thus sealed against the entrance of moisture.

The capsule-coil construction offers



Body and capsule type coil for a circular lifting magnet

the added advantage of permitting "on the spot" repairs to the magnet. Where formerly the complete magnet had to be returned to the factory for rewinding, the user can now remove the capsule soil quickly and easily, insert a spare replacement coil and restore the magnet to service immediately. The damaged coil which has been removed can then be sent to the factory for reinsulating. This feature is available in the 45-in., 55-in., and 65-in. magnet sizes.

When handling scrap pig iron and similar loose material, the pole shoes of a magnet are subject to considerable wear. Removable pole shoes which can be removed after becoming worn and held in place by alloy bolts are also a feature of the new construction.

Pillow Speaker

A miniature radio pillow speaker, developed by Telex, Inc., Minneapolis, Minn., now offers a facility for individual passenger entertainment. Designed for private radio listening through a pillow or head cushion, the speaker provides clear reproduction through the upholstery. It can be attached to any radio or public amplifying system. The individual listener can lean back and hear programs without disturbing anybody

The speaker is designed for mounting in the head rest of seat cushions

else, and it provides an extra service for those passengers who would rather listen to the radio than read or converse with others.

The speaker is 2¼ in. in diameter, ⅝ in. thick, and weighs 2.6 ounces.

Brushes for Diesel Motors and Generators

Morganite, Inc., is now offering brushes to meet the specific needs of traction motors and generators on Diesel-electric locomotives. The brushes have low friction, high mechanical strength and are made with a special pigtail connection which eliminates the use of rivets.

Pigtails are fastened into the brush in many ways. A rivet around which the pigtail is looped may be employed, a pin may be used to lock-jam the flexible shunt into a hole in the brush, a bolt may take the place of the rivet, or the pigtail may be embedded by means of an electric-current-conduct-

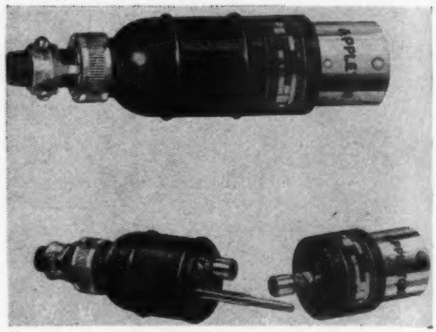
Diesel traction motor brush (split type)—Pigtails are secured in brush material without the use of rivets

ing metal powder which solidifies under pressure around the pigtail and against the walls of a hole in the brush into which the pigtail is fitted.

Morganite's special Diesel pigtail connection is of the latter type. This construction affords two specific advantages.

Plugs and Receptacles

A complete new line of plugs and receptacles has been developed by the Appleton Electric Company, Chicago. The type BP plugs made for flexible cable and also for flexible conduit or armored conductor is rated 20 amp. at 125 volts d.c. or 30 amp. at 230 volts a.c., and is made with 2, 3 or 4 poles. Type AE circuit-breaking plugs and receptacles are made for general industrial purposes.



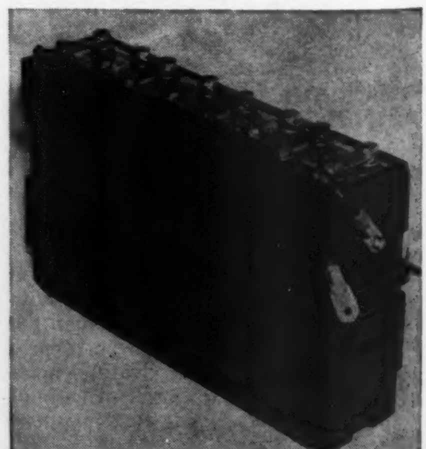
A fused plug, separated in the lower view, to show fuses and ground pole

They are rated 30 and 60 amp., respectively, at 250 volts d.c. and 600 volts a.c., and are made with 2, 3 and 4 poles. Extension cable connectors, in what is designated the APC series have 30, 60 and 100 amp. ratings, and may be used on 250-volt d.c. and 600-volt a.c. circuits.

Appleton BRF fused plugs, one example of the new line, are shown in the illustration. They are designed for use with all types of portable tools since ordinary branch circuit protection is not close enough to protect the delicate windings of portable appliances. The plugs have standard cartridge fuse clips, internally housed, which provide adequate protection in event of insulation break down, overload or phase failure on standard or high-frequency tools. A screw located between the prongs releases the upper and lower members of the fuse chamber. The plug housing is made of a canvas plastic.

Nickel-Cadmium Storage Batteries

Nickel-cadmium storage batteries are now being supplied to the railroad field by the Nickel Cadmium Battery Corporation, Easthampton, Mass., in sizes ranging from 13.5 to 576 amp.-hr. for air conditioning, Diesel locomotive engine starting, signal and crossing gate operations, supervisory control, switch operation in power plants, etc. The batteries are characterized by high mechanical strength and low internal resistance.



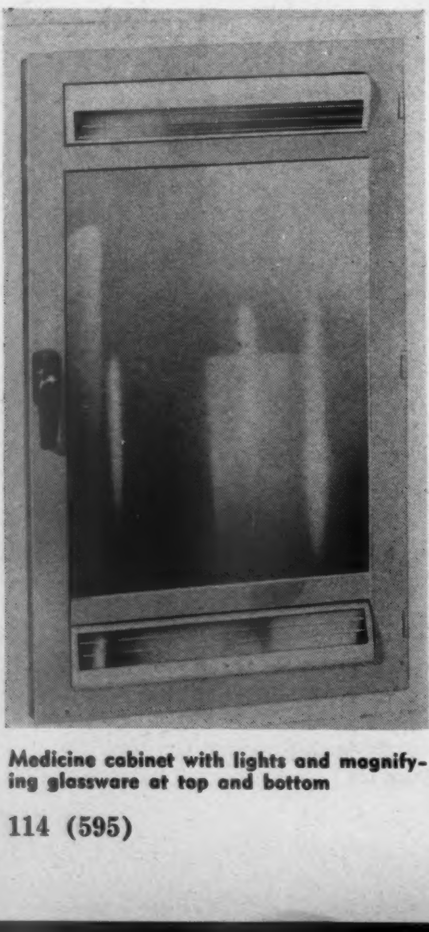
One of the trays for a type SLO33H air conditioning battery

Positive and negative plates are identical in mechanical construction. The active materials are contained in finely perforated thin flat steel pockets. The plates are insulated from each other by thin hard rubber rod separators. The active material of the positive plate consists of nickel hydroxide and specially treated graphite. The active material of the negative plate is a mixture of oxides of cadmium and iron. The electrolyte is a solution of pure caustic potash in distilled water, the solution having a specific gravity of 1.190.

The cell cans are liquid-tight containers made of welded steel. Each cell is fitted with a combination vent and filler opening. The steel terminal posts lead through liquid-tight rubber glands in the top of the cell can and are fitted with nuts for securing flat strip-type intercell connectors. All steel parts are nickel plated. The cells are assembled in wooden trays. Cell cans have steel suspension bosses, resting in rubber cups set into the tray side panels. Air space between the cells serves as intercell insulation.

Controlled Light For Cabinet Mirrors

Magnifying-lensed glassware at the top and bottom of the mirror in medicine cabinet doors, giving high-intensity light on the required areas, has been made available by Luminator, Inc., Chicago, Ill. The top light is mounted high enough above the floor line to illuminate the top of the head, while the bottom unit provides illumination for the underside planes of a person's face for shaving or application of cosmetics. The light pattern is so controlled that it does not disturb passengers seated in the room. The unit is constructed of aluminum extrusions and may be had in satin finish aluminum or prime coat ready for finishing by the user. A similar model is available for surface wall mounting.



Medicine cabinet with lights and magnifying glassware at top and bottom

Weatherproof Fixtures

Goodrich lighting equipment, acquired in September 1947 by the Appleton Electric Company, Chicago, Ill., is now featuring Industrialite fixtures for use in yards, enginehouses and other locations in which fixtures are subjected to severe conditions.

The fixtures have a cast aluminum hood, the flange of which fits under the neck of the reflector to eliminate the possibility of the reflector becoming disconnected from the hood and falling to the ground. Reflectors are permanently finished inside and outside with vitreous, fired porcelain enamel.

An Industrialite fixture for high mounting

As a safety precaution against the breaking of conduit, there are two lugs on the hood which have holes for attaching safety wires. A cast aluminum ring tightened by means of brass screws makes the assembly weatherproof.

Electric Box Furnace

A small electric box furnace with an accurately controlled temperature range from 300 deg. F. to 2,000 F. has been made available by the Cooley Electric Manufacturing Corporation, Indianapolis, Ind. Its broad range permits hardening and other high temperature work, and also low temperature applications such as tempering or drawing of steels, non-ferrous heat treating, etc. Having an 8 in. x 6 in. x 14 in. chamber, the furnace is useful for tool and die work, production heat treating of small parts, running pilot lots, emergency repairs, industrial and laboratory testing, and other work within its range where controlled heating is essential.

The Cooley Model VK-6 electric furnace box

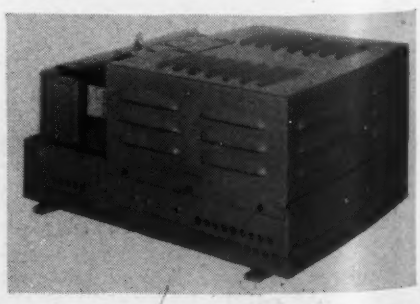
A vertical sliding, counterweighted door conserves heat when charging small parts since only a limited portion of the chamber need be exposed.

The furnace operates on 230 volts and its maximum load is 4,650 watts. Heating is supplied by six embedded-type heating elements, including one in the door. The furnace heats from cold to 2,000 deg. F. in 1½ hr., or to 2,000 in half this time after overnight shutdown. Continuous operation at 2,000 deg. F. is possible.

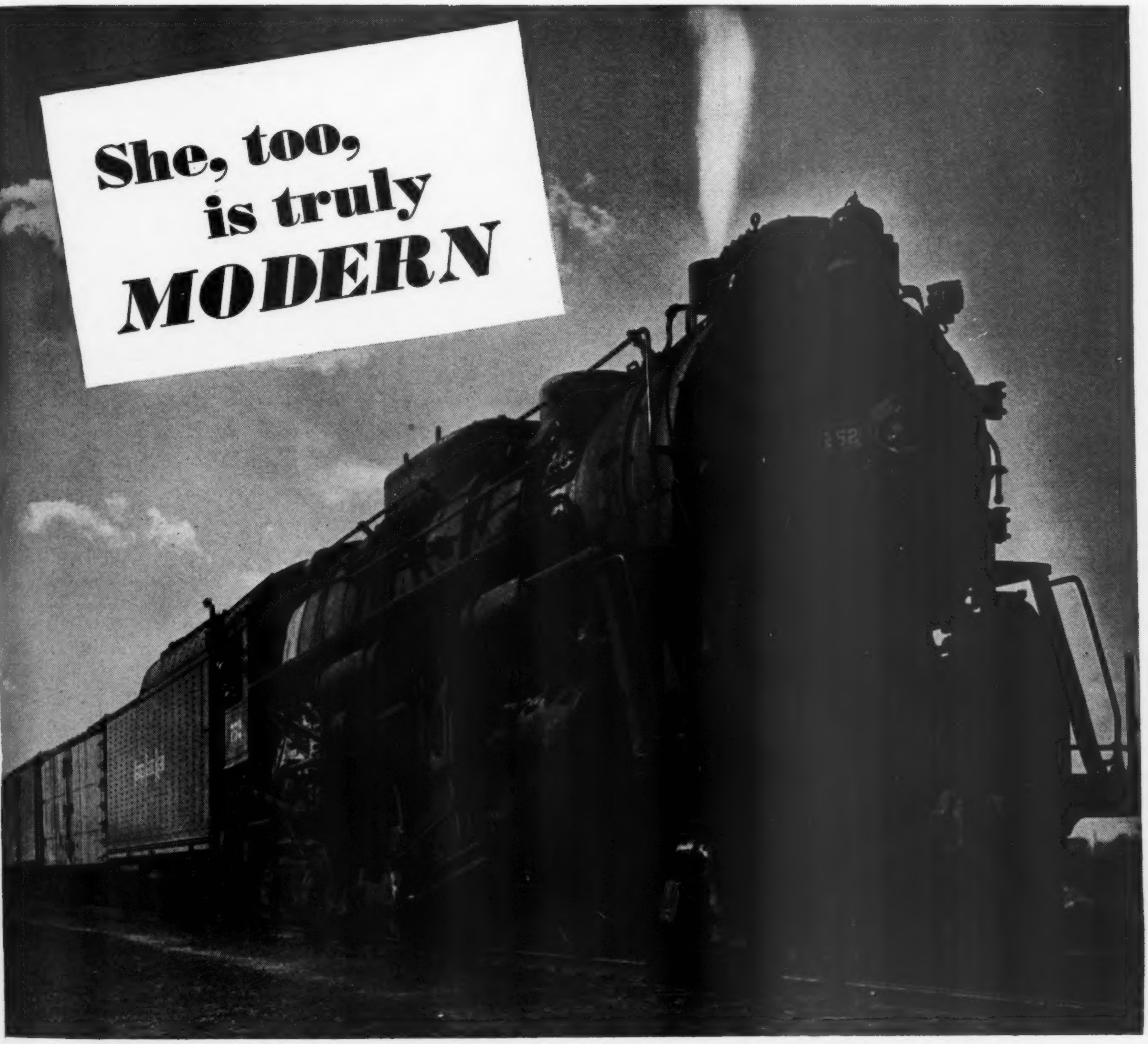
Inverter for Car Lighting

Inverters for supplying fluorescent lamp loads in railway passenger cars are now being made by the Indianapolis, Ind., Division of the Cornell-Dubilier Electric Corporation, South Plainfield, N. J. This company recently purchased the assets of Electronic Laboratories, Inc., Indianapolis, Ind.

The railroad type inverter operates from 32 volts d.c. It draws 325 watts from the power source and produces a.c. power at 100 cycles. It is designed to operate twelve 42-in. slimline lamps, six in series, and two of which are in parallel.



100-cycle inverter for operation of fluorescent lamps on passenger cars


She, too,
is truly
MODERN

NEWS

Railroad Welding Men to Hold Open Meeting

The American Welding Society has scheduled an open meeting on railroad welding problems as part of the program for its twenty-ninth annual meeting to be held at the Bellevue-Stratford Hotel, Philadelphia, Pa., during the week of October 24, 1948. The open meeting will present an opportunity for all railroad men to ask questions and get answers on any phase of welding. Four topics will be discussed covering the use of welding in the construction and repair of passenger cars, freight cars, locomotives and for maintenance of way work. This open meeting will be held Tuesday afternoon, October 26.

In addition to the open meeting seven papers on railroad welding will be presented at two sessions to be held on Monday and Tuesday mornings. On Monday there will be the following papers: Submerged Arc Welding of Box and Hopper Cars by E. A. Watson, American Car & Foundry Co.; Welding the Modern Diesel Locomotive by H. S. Swan, American Locomotive Company, and General Welding Practices in Locomotive and Car Shops by J. Michne, New York Central. At the Tuesday morning session the papers will be: Diesel Locomotive Welding by R. L. Rex, Air Reduction Sales Co.; Submerged Melt and Inert Gas Shielded Electric Welding Applied to Railroad Cars by C. R. Strutz, The Oxweld Railroad Service Co., and Welding Practice in Welding AISI Specification 430 (18 per cent chrome steel) in Locomotive Firebox Applications by Howard L. Miller, Republic Steel Corp.

A.A.R. Wheel Balance Tests

Several runs in the road testing for a study of the riding qualities of railway passenger cars as affected by wheel balance, wheel-tread contour, and track gauge, which has been under way between Coatesville, Pa., and Parkesburg on the Pennsylvania for the past month, were specially conducted on September 17. This study is sponsored and conducted by the Mechanical and Engineering Divisions of the Association of American Railroads, with the co-operation of the Budd Company, Philadelphia, Pa., and the Pennsylvania Railroad. The special test train consists of a C-G-1 electric locomotive, the Budd research car No. 1, and two passenger coaches, the latter being necessary for stability and braking power. Necessary shop work on the test wheels has been handled at the Wilmington, Del., car shops of the railroad. Balancing of the wheel and axle assemblies, as well as balance checking during machining operations, is being accomplished with the Bear Dy-Namic balancer furnished and

Orders and Inquiries for New Equipment Placed Since the Closing of the September Issue

Locomotive Orders

Road	No. of locos.	Type of loco.	Builder
Bangor & Aroostook	2[1]	2,000-hp. Diesel-elec. pass.	Electro-Motive
	4[1]	1,000-hp. Diesel-elec. switch	Electro-Motive
	8[1]	1,500-hp. Diesel-elec. branch-line units	Electro-Motive

Freight-Car Orders

Road	No. of cars	Type of car	Builder
Chicago, South Shore & South Bend	4[2]	70-ton covered hopper	General American
Delaware & Hudson	100[3]	70-ton covered hopper	Greenville Steel Car
	20[3]	Air-dump	Magor Car
Illinois Central	750	50-ton hopper	General American
	100	70-ton covered hopper	General American
	500	50-ton hopper	Pressed Steel Car
	1,750	50-ton hopper	Pullman-Standard
Minneapolis, St. Paul & Sault Ste. Marie	500	50-ton box	Co. Shops
	50	50-ton automobile	Co. Shops
Norfolk & Western	10	Caboose	St. Louis Car
Pittsburgh & West Virginia	600[4]	50-ton hopper	Pressed Steel Car
	300[4]	50-ton gondola	Bethlehem Steel
Virginian	1,000[5]	55-ton hopper	Pressed Steel Car
	500[5]	50-ton hopper	Co. Shops
	25[5]	Caboose	St. Louis Car
Wabash	600[6]	50-ton box	Co. Shops

Freight-Car Inquiries

Road	No. of cars	Type of car	Builder
Duluth, South Shore & Atlantic	100	50-ton box	....
	100	50-ton gondola	....
New York, Chicago & St. Louis	500	50-ton box	....

[1] The new equipment will cost $2,091,248. The 2,000-hp. passenger and the 1,000-hp. switching units are to be delivered in the first quarter of 1949; and the 1,500-hp. branch-line units, next April. When these are delivered the B. & A. will be completely Dieselized, except during the winter months when heavy potato shipments will necessitate the use of some of the present steam power on potato trains. Also, during the heavy shipping season this winter it may be necessary to discontinue the use of Diesel power now on passenger trains until the new equipment is received.

[2] For delivery in the second quarter of 1949.

[3] Scheduled for delivery next spring.

[4] Deliveries scheduled to begin next February.

[5] For delivery in the first quarter of 1949.

[6] To be built at the Decatur, Ill., shops during 1949.

Notes:

Central of New Jersey.—E. T. Moore, chief executive officer of the Central of New Jersey, has announced that he has recommended to the roads' trustee that the Newark, N. J., federal court be asked for authority to purchase 14 1,500-hp. Diesel-electric locomotives at a cost of more than $2,000,000. Twelve of the new Diesels are to be assigned to passenger service and two to freight service as another step in modernizing and improving suburban-commuter passenger service. It is anticipated that the first of the new locomotives will be delivered in late September or early October and that the entire lot will be in operation before March, 1949. With these additional Diesels, all passenger trains operating between the Jersey City, N. J., and Raritan terminals on the road's main line, and 80 per cent of the Jersey Central trains on the New York & Long Branch, will be Diesel-powered.

Chesapeake & Ohio.—Forty-six stainless-steel passenger cars now being delivered to the Chesapeake & Ohio by the Budd Company, and which were originally designed to operate as the "Chessies," are to be distributed among the various divisions of the road's system, it was announced this week. Trains 3, 5, 6 and 8 on the former Pere Marquette between Chicago and Grand Rapids, Mich., will receive six coaches, a twin-unit dining car and an observation-dome car. A baggage-coach car also will operate on this train between Chicago and Muskegon, Mich. Other system trains will absorb the remaining cars.

Chicago, Burlington & Quincy.—Sixty all-steel suburban cars and 25 main-line coaches will be rebuilt and modernized for suburban service by the C. B. & Q. in a program now under way and which will continue at the rate of three cars per month. Improvements will include modified air-conditioning, new seats or upholstery, improved lighting and complete interior redecoration. All of the modernized cars will have enclosed vestibules to check smoke, cinders and dust and will be painted to simulate stainless steel. In addition, the road is considering the purchase or construction of 25 or 30 new suburban coaches of the latest design for replacement of cars which will be retired. Specifications for these new cars—to be assigned to the Chicago-Aurora, Ill., service—have not been completed, but are said to include many innovations in suburban-car construction. It is expected that deliveries will require two years. One of the first two coaches to be turned out of the road's Aurora coach shop soon for service on the Chicago-Aurora trains will demonstrate three different types of seats on which passenger reaction will be sought as a guide to the permanent type of seating for subsequent cars. Because of the continuous opening of car doors in suburban service, the air-conditioning on the cars is not intended fully to duplicate that on through trains. It is expected, however, to keep the car interiors as cool as or cooler than outside temperatures.

Pennsylvania.—The Pennsylvania's postwar plans for new equipment and equipment improvement so far disclosed will, when fully consummated, involve a total expenditure of $216,700,366. The table lists the various types of equipment included in the program and the amounts that will have been spent when the present program is completed. The program contemplates, among other things, reequipping the "Senator," providing afternoon service between Washington, D. C., and Boston, Mass., and the "Congressional," between New York and Washington. These two trains will afford what is described as something new in the way of daytime accommodations—small private rooms for two or four persons.

P.R.R. Equipment Program

No. Units	Type	Cost
137	Diesel-electric road passenger and freight locomotives	$74,327,517
429	Diesel-electric switching locomotives	36,039,697
212	All-room sleeping cars and observation and lounge cars with sleeping rooms	27,148,000
118	Overnight coaches	11,327,214
40	Dining cars, including 16 twin-units	5,013,430
25	Observation, lounge and feature cars without sleeping rooms	2,948,330
273	Modernized coaches, parlor, dining and feature cars	18,121,900
4,400	Box, gondola and hopper cars	22,426,600
8,149	Modernized freight cars of many types	19,347,678

operated by the Bear Manufacturing Company which is located at Rock Island, Ill.

The purpose of the study is to improve the riding qualities of passenger-train equipment in so far as they are affected by certain wheel conditions, such as unbalance, eccentricity of tread, tread contour, and worn tread, and by the gauge of track. Balance studies are being made with wheels which have been artifically balanced or unbalanced by adding weights and also with wheels which have been progressively machined at the rims, hubs, and plates, but which otherwise have not been balanced. Artificial unbalance has been carried as far as 10 lb. at the rim. Road tests and balance checks are made after each part of the machining program, so that the effect on riding quality may be recorded and the effect of machining evaluated. Worn treads are being simulated by machining. Except for one series of tests, with wheels having cylindrical contours, all tests are made with conical treads. Fifteen wheel conditions have been tested.

A special test section of track has been prepared by the Pennsylvania over which all series are being run at speeds of 40 to 100 m.p.h. This section consists of one mile of track with the standard gauge of 56½ in., one mile with a gauge of 56⅜ in., and one mile with a gauge of 56¼ in.

Accelerometers measure accelerations in three directions at both ends of the car, at a journal box and vertically on a seat. Electrical movement gauges measure the lateral and longitudinal movements of all wheels on one truck, the car-body roll and vertical displacement. A mechanical recorder indicates the swing of the truck and movements in the springs. The electrical instruments require two 12-channel and one 6-channel electronic amplifier units. Two 12-channel and one 24-channel oscillographs photographically record the indications continuously. Various other records, such as train speed, phase position of the wheel unbalance, and moving-picture records of truck action are obtained.

The instrumentation is furnished by the Association of American Railroads and the Budd Company.

Supply Trade Notes

American Locomotive Company.—One hundred years of locomotive manufacturing in Schenectady, N.Y., were celebrated in that city on September 24, 25, and 26. A 110-ft. flagpole honoring its war dead was presented to the city on behalf of the 6,500 employees of the American Locomotive Company at Schenectady. Later in the day ceremonies were held at the executive office building of the company where a bronze plaque commemorating the centennial observance, presented by the Chamber of Commerce, was unveiled. The fiftieth anniversary of President Robert B. McColl's connection with the company was also observed on September 24 at a dinner tendered in his honor by the Chamber of Commerce. On Saturday, September 25, a luncheon, attended by Mr. McColl and many other 50-year employee veterans, was given in honor of Alco's retired employees. Later in the day an open-house program was held for employees and their families. On Sunday, September 26, the plant was open to inspection by the citizens of Schenectady.

John Thomas has been appointed manager of the American Locomotive Company's locomotive division, and William G. Miller has been appointed manager of the company's plant at Auburn, N.Y. Mr. Thomas, formerly manager of the Auburn plant, is now located at Schenectady, N. Y., and will be in charge of engineering, purchasing, service, renewal parts, and inspection phases of the locomotive division. He will continue also to supervise manufacturing departments of the division at Auburn. His activities will be coordinated with those of W. E. Corrigan, vice-president in charge of sales of the locomotive division, and with those of J. J. Smith, manager of the Schenectady plant.

John D. Coleman has been appointed regional service manager for the western region of the American Locomotive Company, with headquarters in Chicago. *Carl A. Gandy, Jr.,* has been appointed district sales representative, with headquarters in Atlanta, Ga., to replace *John F. Corcoran,* who has been transferred to the Chicago office to take charge of sales activities for the railway steel spring division in the Chicago area. *Paul N. Strobell* has been appointed district engineer for the New York district.

Carl A. Gandy became associated with Alco in 1940 and has been a service engineer in the New York and Atlanta, Ga., districts as well as in Mexico and Brazil.

John F. Corcoran joined Alco in New York in 1940 and two years later was assigned to the Washington, D.C., office to work on war production problems. He was appointed district sales manager in Atlanta in February, 1947.

Paul N. Strobell joined the American Locomotive company as a service engineer on Diesel-electric locomotives in 1941. He was assigned to install the first Alco switchers on the Central Railway of Brazil in 1943 and after his return to the United States in July, 1943, he entered the Navy as a lieutenant. He rejoined Alco's service department at Schenectady, N. Y., after his discharge in August, 1946.

John Thomas is a graduate of Alabama Polytechnic (1919). Upon graduation he was engaged in engineering and sales of ship propulsion machinery for the Federal and Marine Department of the General Electric Company. He became associated with McIntosh & Seymour in Auburn in 1929, where he held the positions of manager of sales for the New York territory and of sales manager prior to the acquisition of that firm by the American Locomotive Company in 1939.

William G. Miller was transferred from Schenectady to Auburn as assistant to the manager on March 1, 1948. For the previous three years he had been assistant to the vice-president.

John D. Coleman joined Alco in 1939. In November, 1942, he entered the United States Army as a captain in the Transportation Corps. He returned to Alco's locomotive field service division in October, 1945.

◆

Simmons-Boardman Publishing Corporation.—*S. Wayne Hickey,* vice-president of the Simmons-Boardman Publishing Corporation and heretofore district manager of advertising sales, transportation papers, with headquarters at Chicago, has been named to fill the newly created position of vice-president, advertising sales, transportation papers. Mr. Hickey will have offices in both Chicago and New York. *C. Miles Burpee,* vice-president of the corporation in general charge of advertising sales on the transportation papers, has been named vice-president, sales promotion and service, transportation papers. His headquarters will be at New York as heretofore. He will continue also as business manager of Railway Age and will be publishing director [not publicity director as noted in the September issue] of the company's transportation cyclopedias. *John R. Thompson,* formerly vice-president and treasurer of the Maclean-Hunter Publishing Corporation, with headquarters at Chicago, has been appointed district manager of advertising sales, transportation papers, at Chicago, succeeding Mr. Hickey.

S. W. Hickey

Mr. Hickey was born at Camden, Ark., on December 7, 1905, and received his higher education at the University of Arkansas. He entered railway service in April, 1925, as a gravel and ballast inspector of the Illinois Central, subse-

Salute To a Pioneer

GENERAL MOTORS LOCOMOTIVES

Array of General Motors Diesel power at the Chicago and North Western's streamliner ramp. On the left is the "City of Portland" eastbound to Chicago. Three General Motors Diesel locomotives, two of which power the "400's," are on the next two tracks. Then the "City of Denver," Twin Cities "400," "City of Los Angeles" and "City of San Francisco."

Proud of their own history as pioneers in modern railroad motive power, the makers of General Motors Diesel locomotives take special pride in saluting the Chicago and North Western Railway, now celebrating its 100th Anniversary as the first railroad in Chicago and the first in the West.

ELECTRO-MOTIVE DIVISION

GENERAL MOTORS LA GRANGE, ILL.

Home of the Diesel Locomotive

quently serving as chainman, rodman and valuation accountant on that road. In April, 1931, he became associated with Simmons-Boardman in the circulation department at Chicago, and in December, 1936, was advanced to advertising sales representative. Mr. Hickey was promoted to business manager of Railway Engineering and Maintenance and western manager, advertising sales of Simmons-Boardman in September, 1944. He was elected also vice-president of the company in February, 1946.

Mr. Thompson, who was born on July 23, 1900, and educated at the University of Toronto, has devoted his entire business career to the newspaper and business publishing fields. Immediately upon leaving college in 1918 he became assistant financial editor of the Toronto Globe, with headquarters at Toronto, Ont., and from 1920 to 1923 was a junior account executive in the advertising agency of A. McKim Ltd., at Toronto. The following year he became advertising manager

J. R. Thompson

of Consolidated Press, at Toronto. In 1925 Mr. Thompson went with the Maclean-Hunter Publishing Corporation and for 13 years was manager of its Chicago office. During the next three years he was advertising manager of Maclean's magazine, with headquarters at Toronto. In 1940 he returned to Chicago as vice-president and treasurer of the corporation, in full charge of the publishing activities of its business journals (Inland Printer, Chemical Industries, Rock Products) in the United States. He relinquished these positions to join the staff of Simmons-Boardman as district manager of advertising sales, transportation papers.

◆

Westinghouse Electric Corporation.—*A. C. Monteith,* engineering executive of the Westinghouse Electric Corporation, has been elected vice-president in charge of engineering and research to succeed Marvin W. Smith, who has been elected executive vice-president of the Baldwin Locomotive Works. *C. B. Dick,* manager of the feeder division since 1945, has been appointed works manager of the East Springfield, Pa., appliance division plant, to succeed *James R. Weaver,* who is now manager of manufacturing for the Baldwin Locomotive Works.

Fansteel Metallurgical Corporation.—*Joseph A. Teece,* assistant to the president of the Fansteel Metallurgical Corporation has been elected vice-president. The company has acquired all the common stock of the *Vascoloy-Ramet Corporation* held by the Vanadium-Alloys Steel Company. Before this transaction, two-thirds of the common stock of Vascoloy-Ramet was owned by Fansteel and one-third by Vanadium-Alloys. Vascoloy-Ramet will continue to be operated under its own name as a division of Fansteel.

◆

Baldwin Locomotive Works.—*Marvin W. Smith,* formerly vice-president in charge of engineering and research for the Westinghouse Electric Corporation, has been elected executive vice-president of the Baldwin Locomotive Works, with headquarters at Eddystone, Pa., as noted in the September issue. *Lewis W. Metzger,* vice-president, has been appointed executive assistant to Mr. Smith, assisting him in all phases of Baldwin operating activities. *James R. Weaver* has been appointed manager of manufacturing—Eddystone division, and *John S. Newton* manager of engineering—Eddystone division. Both Mr. Weaver and Mr. Newton also were formerly with Westinghouse Electric.

Mr. Smith is a graduate of the Agricultural and Mechanical College of Texas (1915) with a degree in electrical engineering. He joined the Westinghouse Electric Corporation as a student engineer and in 1930 was appointed division engineer in charge of the de-

M. W. Smith

signing of generators for the Hoover and Norris Dams. He was appointed manager of engineering in 1936 and was elected vice-president in charge of engineering and research in 1939.

Mr. Weaver joined the Westinghouse Machine Company, at East Pittsburgh, Pa., and was works mechanical engineer when that company moved to Philadelphia, Pa. He remained at East Pittsburgh with the Westinghouse Electric Corporation holding various positions until his appointment as superintendent of manufacturing equipment. He later was appointed director of equipment inspection and tests and held that position until he assumed responsibility for the operation of the United States Naval ordnance plant, at Louisville, Ky., during the recent war. Since the end of the war, Mr. Weaver has been in charge of all manufacturing operations at the

J. R. Weaver

Westinghouse plant at Springfield, Mass.

Mr. Newton is a graduate of Oregon State College (1930). He spent the first nine years of his business career with Westinghouse Electric at East Pitts-

J. S. Newton

burgh, and for the last nine years has been in the steam division, at South Philadelphia, Pa., as assistant engineering manager in charge of many phases of the designs and application of both steam and gas turbines, particularly in the marine and transportation fields.

◆

Fafnir Bearing Company; Waugh Equipment Company.—The Fafnir Bearing Company of New Britain, Conn., and the Waugh Equipment Company of New York have joined forces for the manufacture and sale of Fafnir anti-friction railway journal bearings. The staffs of both companies will collaborate in the research and development of these bearings. A new division of the Waugh Equipment Company, to be known as the Fafnir-Waugh Bearing Division, will handle sales, sales promotion, and service, whereas manufacturing will be carried on in the plants of the Fafnir Bearing Company. The bearing will carry the joint name "Fafnir-Waugh." As in the past, require-

ments of railroads for all purposes other than journal boxes will be handled by the Fafnir Bearing Company. Inquiries and orders for passenger-car, freight-car and locomotive anti-friction journal bearings for use on railroads in the United States and all foreign countries, except the Dominion of Canada, will be handled by the Fafnir-Waugh Bearing Division of the Waugh Equipment Company, New York.

◆

AMERICAN CAR & FOUNDRY CO.—*Sheldon Thomas,* assistant to Robert W. Ward, vice-president in charge of production of the American Car & Foundry Co., has been appointed assistant district manager of the firm's Chicago plant. *Henry V. Bootes,* formerly district sales manager, New York sales district, has been appointed assistant vice-president, with headquarters in New York.

Mr. Bootes, prior to 1947 when he became associated with the American Car & Foundry Co., was district manager of the Ohio Injector Company. During World War II he saw combat duty in the South Pacific area where he served as a major in the Marine Corps.

H. V. Bootes

◆

GREAT LAKES STEEL CORPORATION.—*Edward W. Fitzgerald* has been appointed sales representative for the nailable steel flooring of the Great Lakes Steel Corporation. Mr. Fitzgerald, who was formerly associated with the Union Asbestos & Rubber Co., will have offices at 20 North Wacker drive, Chicago.

◆

SPRING PACKING CORPORATION.—*William O. Martin,* inventor of numerous railway devices and formerly in engine service with Missouri Pacific, has joined the Spring Packing Corporation, at Chicago, as assistant vice-president for the purpose of exploiting additional inventions and developments.

◆

William O. Martin first entered railroad service in Mexico in 1905 as a locomotive fireman. He later served as a locomotive engineer, and in 1912 went to El Reno, Okla., where he joined the Chicago, Rock Island & Pacific as a

fireman. From 1917 until 1919, he was in charge of coke ovens, coal washing machinery and railroad equipment for the Howe-McCurtain Coal & Coke Co. He joined the mechanical department of the Missouri Pacific in 1919. In 1928 he became associated with the Rees Manufacturing Corporation (later known as the Superior Railway Products Corporation). He joined the Ajax-Consolidated Company in a consultant capacity in 1944 and on December 1, 1947, returned to the M. P. in engine service.

◆

LENKURT ELECTRIC COMPANY.—*D. Gordon Clifford,* formerly chief engineer of Industrial & Commercial Electronics, has been appointed field engineer for the Lenkurt Electric Company, San Carlos, Calif.

◆

ARMCO STEEL CORPORATION; JACKSON TUBE COMPANY.—The Armco Steel Corporation has contracted to purchase the assets of the Jackson Tube Company, Piqua, Ohio. This company is now being operated as the tubing division of the Armco Steel. *Samuel E. Jackson,* president, is manager of the new division.

◆

GENERAL ELECTRIC COMPANY.—The General Electric Company has announced the appointment of the *Graybar Electric Company* as national distributors for the resin and insulation materials division of General Electric's chemical department.

◆

PYLE-NATIONAL COMPANY.—*Durward I. Packard,* formerly district manager of the Baldwin Locomotive Works at Chicago, has been elected vice-president in charge of sales of the Pyle-National Company, Chicago.

Durward I. Packard was born on November 26, 1894, in Granville Township, Pa. He was educated in the public schools at Jersey Shore, Pa., and in 1911

D. I. Packard

was employed in the motive-power department of the New York Central. Mr. Packard joined the Franklin Railway Supply Company in 1924, serving successively as supervisor of manufacturing operations, plant manager at Baltimore,

Ohio, and assistant western sales manager at Chicago. In 1944 he became associated with the Baldwin Locomotive Works as district manager, Northwestern district, at Chicago.

◆

B. F. Goodrich Company.—The B. F. Goodrich Company will build a new plant in Akron, Ohio, for the manufacture of industrial rubber belting. Four factory buildings will be razed to permit construction of the new plant, which will contain 150,000 sq. ft. of floor space.

◆

Hulson Company.—*Robert Watson* has been appointed to the staff of the Hulson Company at 332 South Michigan avenue, Chicago. Mr. Watson served an apprenticeship in locomotive construction and design at Kilmarnock, Scotland, in which country he was born. He came to the United States in 1923 and joined the Ingersoll-Rand Company as a machinist. Shortly thereafter, he worked as a draftsman for the American Locomotive Company. In 1925 he became chief draftsman of the Erie in Cleveland, Ohio; in 1929, mechanical and sales engineer of the Firebar Corporation, and in 1932, sales engineer and western sales manager for the Waugh Equipment Company. From 1938 to 1941, Mr. Watson was employed by Manning, Maxwell & Moore. In the latter year he returned to Waugh Equipment as assistant to the president and vice-president. Several months ago he was appointed representative of American Welding's railway equipment division.


R. Watson

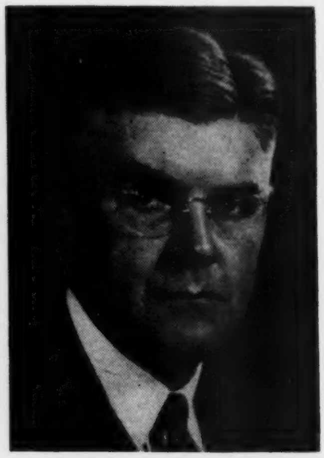
◆

Carlson Company.—The Carlson Company, specialists in the design of springs and mechanical products, have opened a new office at 277 Broadway, New York 7, to provide design and consultation services for manufacturers, engineers, and inventors.

◆

Youngstown Steel Door Company.—*John P. McWilliams* has been elected chairman of the Youngstown Steel Door Company. *Harold H. Henricks* has been elected president to succeed Mr. McWilliams.

John P. McWilliams was born in Chillicothe, Ohio, on January 8, 1891. Upon graduation from Princeton University in 1913 he joined the Canadian National and from 1914 to 1917 was associated with the Oxweld Acetylene Company. In 1918 he was a captain in the United States Army. From 1919 to 1924 he



J. P. McWilliams

worked for the Oxweld Railroad Service Company. In the latter year Mr. McWilliams founded the Youngstown Steel Door Company, of which he was general manager until his election as president in 1933.

Harold H. Henricks is a graduate of the University of Illinois in 1911. After World War I, during which he was a second lieutenant in the United States Air Force, he joined the Camel Company which, in 1925, was acquired by Youngstown Steel Door. Mr. Henricks

H. H. Henricks

became superintendent of the Youngstown, Ohio, plant in 1929, vice-president in charge of manufacturing in 1933, and a director of the company in 1943.

◆

Eutectic Welding Alloys Corporation.—*William R. Bajari*, formerly a field manager for the Eutectic Welding Alloys Corporation, has been appointed regional sales supervisor in the western region of the United States. *L. D. Richardson* and *Robert H. Groman*, formerly assistants to the general sales manager,

have been appointed regional sales supervisors for, respectively, the south central region and the west central region.

◆

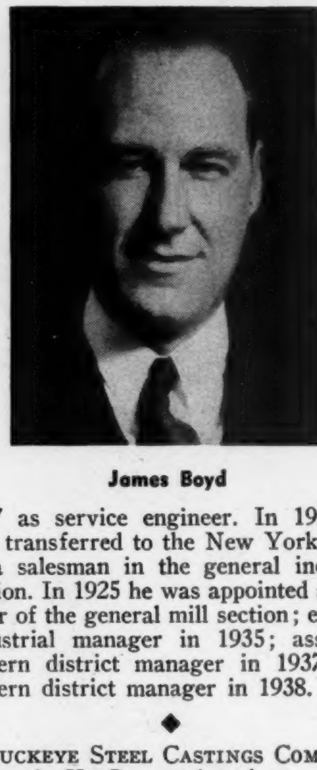
McConway & Torley Corp.—*R. V. Schageman* has been appointed Chicago district sales manager for the McConway & Torley Corp. to succeed the late J. J. Hughes.

◆

General Steel Castings Corp.—The general offices of the *General Steel Castings Corporation* have been transferred from Eddystone, Pa., to Granite City, Ill. The headquarters of the treasury and purchasing departments will remain at Eddystone.

◆

Lima-Hamilton Corporation.—*James Boyd,* formerly eastern district manager of the Westinghouse Electric Corporation, has been appointed general sales manager of the Lima-Hamilton Corporation's Hamilton division. Mr. Boyd is a graduate of Pratt Institute (1917). He joined Westinghouse in



James Boyd

1917 as service engineer. In 1920 he was transferred to the New York office as a salesman in the general industry section. In 1925 he was appointed supervisor of the general mill section; eastern industrial manager in 1935; assistant eastern district manager in 1937, and eastern district manager in 1938.

◆

Buckeye Steel Castings Company.—*Frank H. Bonnet* has been elected president and general manager of the Buckeye Steel Castings Company, to succeed *George T. Johnson,* who has resigned because of ill health.

Frank H. Bonnet joined the company as a molder's helper in the foundry, after graduating in 1909 from Ohio State University as a mechanical engineer. He worked in various capacities until his apointment as first vice-president and works manager, a position he has held for several years.

George T. Johnson has been associated with Buckeye Steel Castings for 42 years. He served in the operating and engineering departments and as head of the sales department. He became president and general manager three years

ago. He will continue on the board of directors.

◆

Dayton Rubber Company.—*Edgar K. Lofton* has been appointed sales manager of the railway division of the Dayton Rubber Company, Dayton, Ohio, to succeed *E. J. Schmidt,* resigned. All railway sales operations will be directed from the Chicago sales headquarters at 1009 W. Washington boulevard. Mr. Lofton has been associated with the railway division for 15 years. He first worked as test engineer for railway V-belts in the factory testing and development department and for the last 14

E. K. Lofton

years has been sales engineer in charge of railway sales in the Chicago district. Mr. Lofton is a committee chairman of the Western Railway Club and chairman of the board of directors, Railway Electric Supply Manufacturers Association.

◆

American Steel & Wire Co.—The American Steel & Wire Co., a subsidiary of the United States Steel Corporation, has announced the creation of a new and separate sales division to handle electrical wire and cable products. *T. F. Peterson,* who has headed the section of the general sales staff of the company devoted to electrical products, has been appointed manager of sales of the new division. New district sales offices under the new organization will be established in Boston, Mass., to serve the New England district; in Cleveland, Ohio, to serve the Central district; in Chicago, to serve the Western district; and in New York to serve the Eastern district. *C. H. Currier* has been appointed manager, New England district, electrical products sales; *V. W. Heimberger,* manager, Central district; *R. A. Coates,* manager, Western district; and *C. M. Vaill,* manager, Eastern district.

◆

American Steel & Wire Co.—*Walter E. Mackley* has been appointed manager of the New York district sales office of the American Steel & Wire Co., a subsidiary of the United States Steel Corporation. *F. L. Nonnenmacher* has been appointed manager of manufacturers' products sales to succeed Mr. Mackley, and *Harold Christopher* has been

promoted to assistant manager. Mr. Mackley succeeds *B. W. Bennett,* who has been appointed assistant to the vice-president-sales. Mr. Bennett will continue to maintain his offices in New York and will handle special assignments.

◆

GRAYBAR ELECTRIC COMPANY—*E. E. Martin,* formerly district operating manager of the Graybar Electric Company, at New York, has been appointed assistant district manager, with headquarters at Boston, Mass. Mr. Martin has been associated with the company for 28 years. *E. A. McGrath,* district operating manager at Detroit, Mich., for the last five years, has been transferred to New York, to replace Mr. Martin. *M. O. McIlvain,* district operating manager at Kansas City, Mo., for 12 years, has been transferred to Detroit, succeeding Mr. McGrath. *A. W. Rimensnyder* of the company's Philadelphia, Pa., office, will be district operating manager at Kansas City, succeeding Mr. McIlvain.

L. G. Fields, district manager at Jacksonville, Fla., for the Graybar Electric Company, has been appointed district manager at Richmond, Va., effective November 1. Mr. Fields will succeed *J. H. Pearson, Jr.,* district manager at Richmond for 22 years, who is retiring at his own request.

Obituary

NEIL C. HURLEY, chairman of the board of directors of the Independent Pneumatic Tool Company, Aurora, Ill., and former president of the firm, died at his home in River Forest, Ill., on August 2, following a heart attack. Mr. Hurley had been active in the company for the past 21 years, directing its expansion first as president and since 1944, as board chairman. He was born at Galesburg, Ill., on May 3, 1870, and served

N. C. Hurley

for many years as a railroad mail clerk with the Chicago, Burlington & Quincy. Mr. Hurley went to Chicago in 1906 to establish, with his brother the late Edward N. Hurley, the Hurley Machine Company. Neil Hurley served as president of the latter company until 1927, when he joined Independent Pneumatic Tool. He became president of that company in 1933.

Personal Mention

General

George W. Bohannon, whose appointment as chief mechanical officer of the Chicago & North Western System at Chicago, was reported in the September issue, was born on December 2, 1902,

G. W. Bohannon

at Duluth, Minn. He attended Cornell University from 1920 to 1923, and is a graduate of the University of Minnesota (1926), with a B. S. degree in mechanical engineering. He entered railroad service in 1926 as a draftsman with the Duluth, Missabe & Northern (now Duluth, Missabe & Iron Range) and, from 1927 to 1944, served as mechanical engineer. He joined the North Western system in the latter year as assistant to the chief mechanical officer, in charge of engineering matters, and in 1945 was appointed assistant chief mechanical officer.

B. N. Lewis, II, general mechanical superintendent of the Minneapolis, St. Paul & Sault Ste. Marie at Minneapolis, Minn., has retired after nearly 50 years of railroad service. Mr. Lewis was born

B. N. Lewis

on August 22, 1883, at Austin, Minn., and entered railroad service in 1901 as a machinist and draftsman apprentice with the Soo Line at Minneapolis. In 1903 he became a special machinist in the employ of the Erie at Meadville, Pa.,

ANGELES"

Pacific's Streamlined Diesel Fleet

and in 1906 became a shop inspector for the American Steel Foundries. He rejoined the Erie in 1908 as gang foreman at Hornell, N. Y., and in 1909 returned to the Soo Line at Enderlin as enginehouse foreman. From 1911 to 1915, Mr. Lewis did special shop work at Minneapolis. In the latter year he was appointed mechanical valuation engineer; in 1917, assistant mechanical superintendent at Fond du Lac, Wis., and in 1924, mechanical superintendent. He was transferred to Minneapolis in 1928, and in 1944 became general mechanical superintendent.

F. T. James, chief of motive power of the Delaware, Lackawanna & Western at Scranton, Pa., has been appointed general superintendent of motive power and equipment. The title of chief of motive power has been abolished.

W. W. Matzke, assistant to vice-president in charge of mechanical matters, of the Chicago & North Western, has been appointed assistant to chief mechanical officer.

Diesel

Andrew J. Dubetsky, master mechanic of the Lehigh Valley at Wilkes-Barre, Pa., has been appointed to the newly created position of system supervisor of Diesel maintenance, with headquarters at Sayre, Pa.

I. R. Pease, superintendent of motive power of the New York, Ontario & Western at Middletown, N. Y., has been appointed superintendent of Diesel locomotive maintenance of the Delaware, Lackawanna & Western at Scranton, Pa.

Car Department

J. J. Larson has been appointed division general car foreman of the New York Central at Buffalo, N. Y.

Electrical

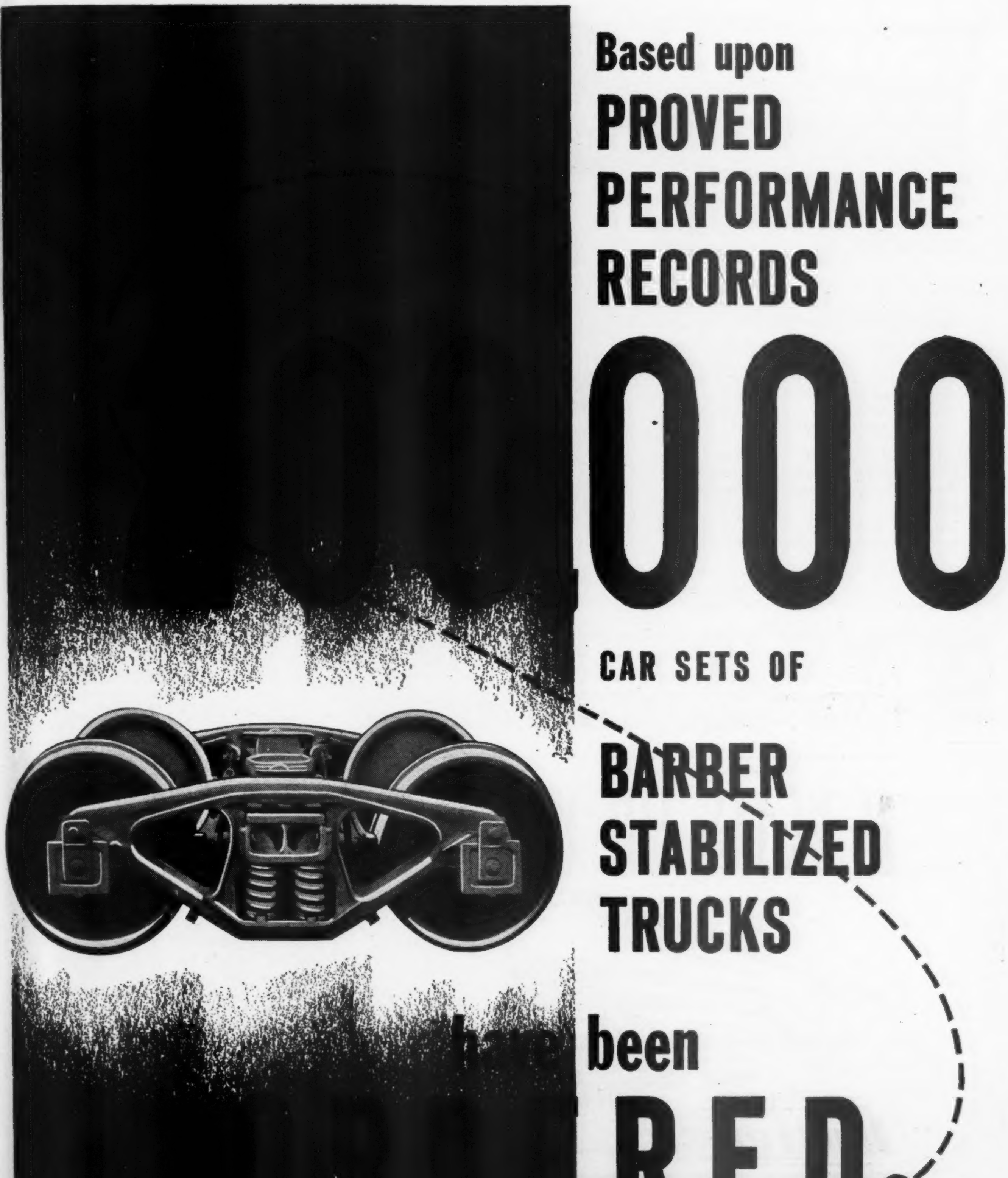
R. A. Crosby, electrical supervisor of the Atlantic Coast Line at Jacksonville, Fla., has been promoted to the position of electrical foreman.

Master Mechanics and Road Foremen

T. G. Roberts has been appointed road foreman of engines of the Canadian National, with headquarters at London, Ont.

T. Collyer has been appointed road foreman of engines of the Canadian National, with headquarters at Lindsay, Ont.

William H. Haynes, who has been appointed master mechanic of the Chicago & Eastern Illinois at Danville, Ill., as announced in the July issue, was born on April 12, 1893, at Springfield, Ohio. He attended Antioch College and in 1912 became a machinist apprentice in the employ of the Cleveland, Cincinnati,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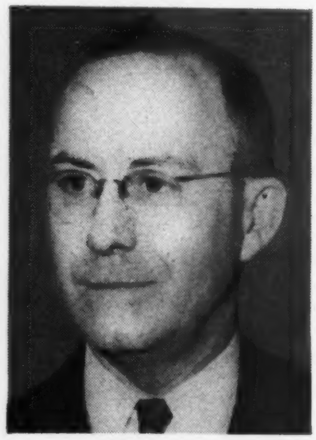
Chicago & St. Louis. While attending college he received special training in tool and die making at the plant of Robins & Myers at Springfield, Ohio, and during World War I was engaged in tool and machine designing. In 1919 he became general machine foreman of the Kansas City Terminal Railroad at Kansas City, Mo. He was subsequently in the service of the Missouri Pacific at Kansas City, in charge of air-brake department and plant equipment, including power plant. In 1934 he was transferred to Little Rock, Ark., in charge of plant equipment, powerhouse, and Diesel repairs. During 1945-46 he was production engineer on aerial torpedoes for the Government, in the employ of the Cameron Manufacturing Company, Houston, Tex. On August 15, 1946, he became general enginehouse foreman of the Chicago & Eastern Illinois at Danville, and on January 16, 1948, was appointed master mechanic.



W. H. Haynes

Shop and Enginehouse

Fred J. Leidolf has been appointed general supervisor of piecework schedules of the New York Central, with headquarters at Buffalo, N. Y.

J. E. Gogerty, general locomotive foreman of the Union Pacific at Cheyenne, Wyo., has been appointed superintendent of production at the company's Omaha (Neb.) shops.

Obituary

John A. Pilcher, retired mechanical engineer of the Norfolk & Western, died on July 28. Mr. Pilcher was born on January 24, 1868. He was educated at Cornell University and began his career with the Richmond Locomotive and Machine Works, predecessor of the American Locomotive Company. He became an employee in the mechanical department of the Norfolk & Western on January 13, 1891, and was a mechanical draftsman for eight years. He then became a member of the engineering staff of the Baldwin Locomotive Works. He returned to the N. & W. in 1902 as mechanical engineer and retired on December 1, 1938.